NATIONAL PETROLEUM NEWS

May 1, 1946

TECHNOLOGY DEPARTMENT

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DETROIT

Oil Heat Institute Convention, Exposition Set Record

W. A. Matheson, president of Oil Heat Institute of America, is shown speaking at ceremonies opening the National Oil Heat Exposition at Commercial Museum in Philadelphia last week

Interest in oil heat never has been greater than it is today. This was conclusively proven when the Oil Heat Institute of America held the biggest convention and exposition in its history at Philadelphia last week. More than 5000 industry men, from all sections of the United States and Canada, registered for oil heat's greatest show, attended convention sessions and special meetings. The story of the convention and exposition is told in this issue of National Petroleum News by two NPN staff writers.

STATION INSPECTION—Value of following a prescribed outline in checking housekeeping and merchandising conditions at service stations is illustrated in story on p. 38. It tells how a station which was thought to be perfect was inspected, using an NPN Inspection Form, and found to rate only 86%.

NEW MERCHANDISE—Many jobbers are hunting non-automotive items to fill up their shelves and provide profitable new merchandise which can be sold at service stations. Problems encountered in obtaining scarce articles and a list of items in demand are revealed on p. 42.

This Business Demands Tough Equipment

That's right, ask the fellow who's been in the business a long time — he'll tell you that toughness is the important thing in oil equipment. Wherever you find Morrison equipment at work, you'll find Tough Equipment, tooled to stand up under years of rough usage. Morrison's toughness is in the blending of special alloys . . . in the microscopic tolerance of valve facings . . . in the basic design of moving parts. If you need tough equipment, Morrison products belong in your plant.

MORRISON BROS. COMPANY

OIL EQUIPMENT HEADQUARTERS

DUBUQUE, IOWA

In tractors that plow and sow and reap... in trucks that rush farm products to markets and canneries . . . in automobiles and buses that keep farm families in touch with their communities... gasoline plays a vital part in modern American agriculture.

America's farms run on gasoline

LIKE most other business men, farmers depend a great deal on gasoline transportation to help run their "factories" efficiently and profitably. And, like most other business men, they profit from every reduction in the cost of gasoline power.

Over the years such reductions have been many. Through improved refining methods and the use of antiknock fluid made by Ethyl, oil companies have been producing increasingly better gasolines. And each improvement in gasoline quality has made possible the design of more powerful and more efficient engines for cars, trucks, buses and tractors.

Petroleum refiners have endeavored to keep gasoline quality at high levels in order that the benefits of more efficient engines may be realized in actual service. Anything that lowers the quality of gasoline —such as restrictions on octane number which were unavoidable in wartime—not only prevents the operation of existing engines at full efficiency but is a bar to further progress. However, as the oil industry is permitted to use its best efforts for the continued improvement of gasoline quality—better and more economical transportation will become available not only to farmers, but to everyone. Ethyl Corporation, Chrysler Building, New York 17, N. Y.

More power from every gallon of gasoline through

ETHYL

ETHYL BRAND OF ANTIKNOCK COMPOUND — ETHYL CORPORATION

Research · Service · Products

He Heads Petroleum Marketers in Florida

J. B. Love

When Florida Petroleum Marketers Assn. meets June 5 at the Riviera Hotel, Daytona Beach, Fla., John B. Love will occupy the president's chair. But his presidential talents are not limited to directing the activities of the Florida marketers. He also is at the head of Colonial Oil Co., Jacksonville.

Mr. Love is no newcomer to the oil business, having spent all his working career dealing in petroleum.

Upon graduation from the University of West Virginia (his home state, incidentally) in 1927, he became associated with Pure Oil Co. At various times he was superintendent of terminals at Savannah, Ga., Norfolk, Va., and state manager handling all retail sales in South Carolina.

In 1935 Mr. Love was named president of Peoples Oil Co. of Atlanta and remained with the company in that capacity for two years.

It was in 1937 that he rejoined Pure Oil. He held an executive position in West Virginia for a year and then began a survey and study of terminal and transport losses in connection with transports and tankers.

The year 1940 found Colonial Oil Co. of Jacksonville, Fla., in the process of reorganization and in the course of events Mr. Love took over the reins as the new president. He has remained at that post since.

A confirmed batchelor, Mr. Love is a fishing enthusiast and has a fine Chris-Craft cruiser which affords him plenty of opportunity to indulge in his favorite hobby.

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NATIONAL PETROLEUM NEWS
NPN
NEWSMAGAZINE FOR OIL MANAGEMENT MEN

Oil Industry Equipment Gets Go-Ahead as CPA Supplement Clarifies Building Order

Tanks, Lifts, Conversion Burners, Refinery Items Listed as Exempt in New Official Interpretation Issued by Agency

NPN News Bureau

WASHINGTON—Petroleum industry equipment generally is exempt from Veterans Housing Program Order 1. This was made clear by the Civilian Production Administration this week in a supplement to the original order which answers many questions that have been asked by the industry.

Points of special interest to oil men in the supplement are (quotation marks indicate language of supplement):

1. "Oil refinery processing equipment, such as towers, reactors, heat exchangers and furnaces", "fueling equipment", "fuel oil tanks", "tanks", "lighting systems," are used as examples of "equipment exempt completely from the order if installed outside of and not attached to a building." This exemption, the supplement says, "is applicable whether or not a foundation must be built for the piece of equipment and whether or not the equipment is connected to a building by pipes or pipelines, wire or the like."

2. "Service station equipment such as gasoline pumps, hydraulic lifts, battery chargers" are "never considered fixtures or mechanical equipment" and "therefore installation of them is not restricted by the order."

3. "Conversion oil or gas burners" are exempt also because they are "never considered fixtures or mechanical equipment."

Other Items Exempt

The supplement also exempts many other items including air conditioning equipment where required to provide humidity or temperature control for industrial processing and self-contained individual units with no duct systems, conveyors, power generating or transmitting equipment such as boilers, generators and transformers (except where the primary purpose of the equipment is to provide electricity or steam for lighting or heating the building in which they are located), scales, stokers, "other processing equipment and machinery", "other machinery and equipment installed to provide a special service in a structure and not installed merely to operate the structure."

As stated in the original order, alterations to a building incidental to installation of equipment are restricted. This was not changed by the supplement. Labor expense for installing exempt equipment, however, need not be counted in figuring the cost of a job.

In an effort to obtain clarification of the order for the oil industry, NATIONAL PETROLEUM NEWS last week submitted a list of specific questions to CPA. Answers to these questions were included in the supplement and provide the greatest step yet taken to make the order clear to the petroleum industry.

District Office Decisions

In addition to seeking interpretations from CPA at Washington, NPN checked district CPA offices at several points in the country for building order rulings affecting the oil industry. The results of this survey show that agency policies seem to vary with each regional office. In some areas applications for service station building permits receive CPA approval with few exceptions. In others, the service station planner finds he has but a slight chance of obtaining an OK.

Generally speaking, however, CPA approvals for oil industry laboratory, research, refining and production facilities have been forthcoming throughout all regions.

A summary of reports from various sections follows:

In New York, CPA regional office manager William A. Riehl said he believes "20 or 30" applications for service station construction in the Gotham area have been approved and that he cannot recall a single case of disapproval so far.

A check of various major oil companies presents a somewhat different picture than that portrayed by CPA district office. The Texas Co. reports it has had poor luck even with construction involving $1000 projects in service stations, with CPA contending if they spend that much inside the station, outside construction will exceed permissible figure; therefore most such applications rejected.

Standard Oil Co. of New Jersey says it has taken for granted application for new service stations would be refused, hence hasn't applied. Company is seeking approval of construction of new Esso laboratories but decision so far uncertain.

Socony-Vacuum Oil Co., Inc., has had approvals of a couple of projects, including combination salesroom-lubritorium. CPA has also permitted additions to company's buildings at Olean, N. Y., as part of project already existing. There have been no disapprovals so far.

No decision reached yet as to approval or disapproval of projected additions to laboratory at Paulsboro, N. J.

Pure Oil Co. received CPA approval for construction of office and warehouse terminal building at Richmond, Va., at an estimated cost of $55,000.

Washington's CPA office reports more than $4,500,000 worth of new nonhousing construction, including two service stations and several auto repair and sales buildings.

Also in the east, Sun Oil Co. received approval for construction of its Carbon 13 plant at Marcus Hook refinery.

Midwest

Cleveland CPA office processed 124 construction cases last week, including approval of five service station projects out of a total of 20 applications. Other 15 station applications have not yet been processed.

Of 124 cases handled, 10 cases were denied for a total value of $479,355 and 109 cases approved totaling $8,107,918. No oil bulk plant applications have been processed.

One midwest major reported CPA has approved 100% everything it has asked for, including several service stations.

Southwest

Dallas district office seems to be taking liberal view of petroleum construction, E. H. Hiett, district manager, saying that in his opinion oil industry is eligible for preferential treatment in that it is producing and dispensing a critical product.

San Antonio office, George W. Chambers, manager, says each case would have to be considered on its individual merit.

At Dallas Mr. Hiett said that other than service stations, his office has approved added construction to Chicago Corp.'s dehydration plant at Carthage. Dehydration plant was already well under way when freeze order came but the corporation wished to add another building.

At San Antonio, Plymouth Refining Co. applied for refinery construction in South Texas but application has not yet been approved.

Shell Oil applied for construction of lube plant at Houston and other refinery units but so far has received no verdict from CPA.

As mentioned previously, CPA policy seems to vary in each office. A summary of regional and district CPA views on oil industry construction, particularly as relating to service stations, follows by cities:

New York—"Housing order caught many applicants committed to certain

obligations. Persons planning to build service stations had sites purchased, some had begun excavations, others were returning veterans. In such cases we granted the applications. An applicant has as good as a 50-50 chance. We try to strip the case to its bare essentials and determine whether it is a matter of necessary construction. If a man is hooked for a franchise, for example, we are usually lenient."

Mr. Riehl went on to say that neither refinery nor bulk plant construction has been approved as yet but that he would be "inclined" to regard such projects as non-competitive with veterans' housing and hence would look upon them sympathetically. He added, however, that each case must be judged on its individual merits and that he cannot give blanket approval to an industry as such.

Cleveland — District Manager Glenn W. Thompson says his office generally had given favorable consideration to applications indicative of "acute individual hardships." In hardship cases, such as one where a station was located on property that had been sold and eviction proceedings instituted, approval for construction of a new station was given. He warned, however, that plans instituted after March 26 would generally result in rejection of application unless necessity was established. Necessity, he added, might include a case where investigation showed the need for construction of a station in an area without such facilities at the time the application was filed.

Washington—Edward M. Synan, local CPA director, said each application is considered on its own particular merits but gave these "hypotheses" when asked by NPN on what grounds he judged service station construction essential:

1—When a businessman has invested "considerable amounts of money" in purchase of lots and building materials but has not been able to begin actual work on his station prior to March 26.

2—When a service station operator is being evicted from his present place of business and is forced to build a new station in order to continue in business.

Dallas—Manager Hiett told NPN that where a man had borrowed money or made other commitments, such as taking a franchise, he would approve service station construction since to turn it down would work undue hardship on the applicant. He said he has had a good many applications to remodel an old station that had been closed and that he had no objection to such construction even if it ran over the $1000 figure.

San Antonio—Manager Chambers asserts each case will be considered on its individual merits. He did not recall having approved any service station construction, although he said there "might have been a few."

Hike May Allocation of Lead for Ethyl Fluid But Refiners Still Under Old Limitations

NPN News Bureau

WASHINGTON—OPA allocated 4160 tons of pig lead for May production of Ethyl fluid, an increase of 650 tons over 3510-ton quota for April.

Pig lead allocation increase, however, gave no relief to refiners who still are governed by CPA's unchanged regulation (L-355) restricting them in May to same amount of tetraehtyl lead used during April.

CPA officials said increase for May was granted to Ethyl Corp., to permit corporation to produce sufficient Ethyl fluid to meet maximum permitted uses of refiners under L-355 (27% per month of amount used during months of November, December and January) and to supply amounts needed to take care of approved "hardship" cases.

Ethyl Corp. had contended that April quota of 3510 tons was insufficient to produce enough Ethyl fluid to supply full allowed use of refiners without depleting stocks of finished lead. The 4160-ton pig lead allocation merely will permit Ethyl Corp. to make a larger percentage in May than in April of the amount of tetraethyl lead which may be sold under the order.

May allocation of 4160 tons is based on CPA decision to give Ethyl Corp. 32% of amount used in first three months of this year (13,000 tons) to produce Ethyl fluid. For April, quota of 27% of same base period was used by CPA in arriving at 3510-ton grant.

CPA used new administrative procedure in setting May allocation for Ethyl fluid production. An amendment to M-38, order governing distribution and use of pig lead, gives CPA authority to make allocations without going to trouble of publishing amendment to M-38.

May quota was determined in a "topside" decision from CPA Chief Small's office after flood of telegrams and letters hit CPA, protesting low allocation of pig lead for oil industry use.

CPA lead officials said Ethyl Corp. has enough stocks of pig lead on hand to meet allocation for May without having to go into critically short metal market and bargain for supplies and without depleting its pig lead inventory below minimum level of stocks sufficient for 30-day supply.

Meanwhile, some hope of settling strikes which have tied up domestic lead smelters was indicated when fact-finding board brought in report recommending wage increase of 18½c per hour for workers in non-ferrous mining industry.

Companies and their subsidiaries involved in wage dispute produce 26% of lead mined in U. S. and operate about 75% of lead refining capacity. It was not immediately certain here what reaction of unions, which have been asking pay hikes of as much as 30c per hour, would be to board's finding.

End of PAW Awaits Action by Snyder

NPN News Bureau

WASHINGTON — Proposed executive order wiping out PAW, effective April 30, was on desk of Reconversion Director Snyder late Tuesday awaiting his formal recommendation to President on final liquidation of war-time oil agency.

Barring a last minute hitch—and none was expected—prospect was that order would reach President Truman's desk for signature before the day was out.

Liquidation order formally cleared Justice Department Tuesday morning but did not reach Mr. Snyder's desk until around 3 p.m. In form sent to White House, it would kill completely all war-time powers exercised by PAW.

White House announcement of death of PAW is expected, when it comes, to be accompanied by announcement of setting up of a new petroleum unit in Interior Department to co-ordinate peace-time oil activities of that and other government agencies.

Action Is Imminent on Navy Fuel Oil Offers

NPN News Bureau

WASHINGTON—Decision at cabinet level was imminent at NPN press time on action Army-Navy Petroleum Board should take on offers of about 100,000 b/d additional Navy special fuel oil at special prices.

Acceptance of the offers was by no means a certainty, as Navy has explored other ways of making up its shortage at lower cost to government.

Small Texas Refinery Shuts Down Due to Price Ceilings

Special to NPN

ABILENE, Tex.—Another small independent refinery—that of Moutray Oil Co. at nearby Hawley—will shut down as of June 1 because it can no longer operate at a profit under present restrictions.

E. W. Moutray, owner of the 24,000-bbl. monthly refinery, told NPN this week that the combination of price ceilings, lead shortage and the fact that he has had to absorb three crude price raises with no corresponding raise in product revenue, brought about the decision to close.

Moutray refinery has been supplying its own distributors in West Texas towns with gasoline, greases and heating oils. He said company would be able to take care of these distributors for a time.

He said the refinery would go on a stand-by basis "until later."

Tidelands Resolution Reported

WASHINGTON—House version of tidelands quit-claim resolution (H.J. Res. 225) was reported to Senate April 26 by its Judiciary Committee with a recommendation for enactment.

Senate passage of resolution in same form as it came from House would send measure directly to the President for executive action.

FTC Takes Detroit Case Under Advisement; Order Rapped by Jobbers, Indiana Standard

National Counsel of Independent Petroleum Assns. Charges Action Means Bankruptcy for Independents

NPN News Bureau

WASHINGTON—Federal Trade Commission had taken under advisement this week motions of Standard Oil (Indiana) to vacate the cease and desist order in the Detroit area price discrimination case and motions of FTC attorneys for modifications of the present order.

At oral argument April 25, counsel for Standard offered seven reasons why the order of Oct. 9 should be set aside and the proceeding dismissed, while commission attorneys said investigation would become merely a case study of evils of price discrimination which could not be corrected.

Appearances also were made by Hubert B. Fuller, counsel for National Counsel of Independent Petroleum Assns., who said nation's 12,000 jobbers were real interested parties in affair, and Cyrus Austin, counsel for Michigan Retail Gasoline Dealers Assn., who accused Standard of "trying to hide behind the jobbers' skirts." Mr. Austin instituted the case against Standard while an FTC attorney.

Arthur J. Abbott of Detroit, attorney retained by Standard, summed up the company's position in these seven points:

1. Transactions on which complaint was based were not made in interstate commerce

2. Right to cut prices in good faith to meet competition is an absolute substantive defense under Robinson-Patman Act.

3. Order does not reflect present conditions, as law provides.

4. Order is not in public interest, since it will lead to higher gasoline prices for public.

5. Order is illegal on number of points, notably price maintenance section.

6. Jobbers are entitled to jobber prices regardless of whether they also sell some products at retail.

7. There is no evidence that the alleged price discriminations tended to injure competition or promote monopoly, and historical facts will prove the opposite.

Walter B. Wooden, assistant general counsel of FTC, maintained issue was not between jobbers and retailers but that of a supplier offering discriminatory prices to certain favored customers.

Noting that four Detroit jobbers involved in case had not asked to appear, Mr. Wooden described NCIPA petition to intervene in case as "an appeal to FTC to uphold what they believe the law ought to be." He said Standard could adequately protect jobbers interests and would have to do so in defending itself.

Answering Standard's contentions, Mr. Wooden made these points:

1. There were no intermediate sales between refinery at Whiting, Ind., and sales to the "favored four" (jobbers involved in the Detroit case), but only such temporary interruptions as Standard found convenient. If this were allowed to pass as intra-state commerce, large corporations could so departmentalize their operations that they would be exempt from every federal law dealing with interstate commerce.

2. Debate in Congress before passage of Robinson-Patman Act made it clear that price cutting in good faith to meet competition was intended only as rule of evidence and not as determinant of substantive rights. FTC would welcome judicial interpretation of this section (2 (b)), however.

3. FTC has no method of determining up-to-date situation every time it issues an order and must act on the record. War-created sellers' market which has existed in Detroit since 1940 is no evidence that practices criticized would not have harmed competition, and actual proof of injury is contained in the record.

4. Tendency to lessen competition alone is sufficient cause for order, although facts in case also showed actual injury. Attempted cost justification for lower prices to "favored four" had been "complete failure."

5. Injury to competitors has been made an ingredient of unlawful competition by Robinson-Patman Act and it would be absurd to think competition could be ruled out by FTC order.

Earlier, Mr. Austin had taken note of some of Standard's arguments when he said the oil company was making a direct attack on the Robinson-Patman Act and particularly that portion which hits corporate fiction. (In this case, a corporate fiction would be a dealer acquiring bulk storage facilities and a few trucks and claiming he was a jobber and entitled to jobber prices).

He said FTC order was designed to prevent unfair competition which injured retailers and did not prevent retailers who were not benefitted by discriminatory prices from selling at lower prices.

Pointing out that a number of jobber organizations supported order—including Michigan Petroleum Assn., National Oil Marketers Assn., Iowa and Missouri Marketers Assns., and National Dixie Distributors, Inc.—Mr. Austin said Standard was trying to keep down dealer's prices in order to collect larger differentials.

"Clean" situation in Detroit since 1940 was attributed to FTC order by Mr. Austin, who said situation would continue to remain "clean" only so long as FTC continued to exercise an interest in the matter.

With regard to price maintenance, he argued that suppliers police jobbers every day ordinarily to see that jobbers do not offer competition to supplier's own retail customers and without this section of FTC order Standard could accomplish by indirection through collusion with jobbers what he said it has done directly.

In opening arguments, Mr. Abbott said it was wholly beyond jurisdiction of FTC to reach out and regulate transactions between jobbers and their reseller customers, since commission's authority extends only to transactions in interstate commerce.

He said price maintenance section also was "ultra vires and void" because it was not based on any allegation in the FTC complaint and involved a third party not included in the proceedings. Effect of the section, Mr. Abbott said, would be to impose "a perpetual OPA in reverse" on the jobbers.

Citing fact that reductions made were necessary to avoid losing customers, Mr. Abbott claimed FTC was trying to deny Standard right to show as defense that price discriminations cited were made in good faith to meet competition by alleging that proof of meeting competition is immaterial.

This view, he said, does violence to Section 2 (b) of Robinson-Patman Act and is at variance with court decisions in the Staley, Corn Products and Moss cases, and with the commission's own decision in the Ferro Enamel case.

"If a supplier cannot meet his competitor's price," Mr. Abbott asserted, "then competition itself has been abolished."

Says FTC Sought to End Competition

Pointing out that jobbers introduced competitive factor which tended away from monopoly, that record of case was barren of testimony to support FTC claim that practices tended toward monopoly and that historical fact would prove that undesirable effects anticipated by FTC had not occurred, Mr. Abbott charged that objective of FTC order was to eliminate competition of jobber-customers so Michigan Retail Gasoline Dealers Assn. could charge higher prices to the public.

Gordon E. Tappan of Chicago, staff counsel for Standard, said association had instigated case to protect its member-dealers from cut prices and that practices cited in FTC compaint had no substantial effect on competition as such, but involved and alleged injury to competitors which is not a proper subject of consideration for FTC.

Unique nature of Detroit market, with economic income of Detroit residents contingent upon condition of automobile industry, provides a fertile ground for sporadic price disturbances and is the basic cause of the difficulty, Mr. Tappan said.

Remarking to commission that there had been no price disturbance in Detroit area since 1940, despite great influx of

war workers and despite fact that Standard continued to sell to jobbers at tank-car prices, Mr. Tappan pointed out that maintenance of higher retail prices was admitted objective of all FTC orders in the case.

He contended that Robinson-Patman Act, designed to protect consumer interests, should not be used to protect certain dealers in Detroit and predicted "drastic" effect on economy if company is not permitted to classify its customers and sell to jobbers for less than it sells to dealers.

Claims It Jeopardizes Jobbers

Mr. Tappan termed FTC order "judicially unlawful, economically unsound, not in the public interest and a restraint on competition." He said it would have these effects:

1. It would mean the gradual elimination of jobbers.

2. It would mean the entrance of additional marketers, who could not exist in free competition, reducing volume of sales per outlet and making it impossible for most dealers to make enough profit on which to live.

3. It would introduce a rigidity into the supplier's operations which would prevent him from experimenting with different methods of distribution and deprive him of diversified activity.

Mr. Fuller said FTC order amounted in effect to a divorcement of retailing from wholesaling and would force jobbers into bankruptcy, voluntary liquidation, or sale to major companies, if allowed to stand.

He reminded commission that its action in this case would set a pattern for marketing operations throughout the country, and called attention to the large competitive factor furnished by existence of jobbers.

Under FTC order, Mr. Fuller said, suppliers who have distribution outlets would be compelled to charge jobbers current tank-wagon price on all products which jobber sold through retail outlets, with jobber able to get tank-car price only on products resold to dealers. Jobbers also would be compelled to sell at the supplier's current tank-wagon price.

Since jobber services cost 1½ to 2½c per gal. of gasoline, this would leave jobbers three alternatives, NCIPA attorney said:

1. They could rely on refiners who do not have retail outlets in particular area served by jobber, although transportation costs would make this impractical.

2. They could buy from refiners in the same state.

3. They could sell or lease their retail outlets.

Mr. Fuller also brought out that price maintenance provision would violate many antitrust statutes, require suppliers to police confidential records of jobbers and prevent jobbers from selling directly to farmers and certain commercial customers.

Commission said it would make its decision on the motions known later, but gave no indication how soon this could be expected.

Suspension of Gasoline Ceiling Prices May Be Announced This Week; Session Set in Chicago

NPN News Bureau

WASHINGTON — Announcement of suspension of gasoline ceiling prices was expected momentarily this week, as oil industry representatives prepared to gather May 3-4 at Chicago's Stevens Hotel to discuss whole decontrol situation with officials of OPA and other government agencies.

Sumner T. Pike, who retired April 30 as OPA fuel price chief, sounded keynote for meeting when he said OPA was anxious to get completely out of oil price control business and would do so immediately except for chance that state regulatory agencies might create synthetic shortages in an effort to help producers get higher prices.

Mr. Pike also feared that elimination of controls—coupled with affects of coal strike and unprecedented demand for all products—might set off spiral of inflation which could not be halted short of complete collapse of price structure, particularly if allowables were cut. He doubted that ceilings on industrial fuel oils could be dropped so long as difficulties persist in the coal industry.

Gasoline suspension program, approved by OPA, was being considered by OES. Indications were that OES would place its stamp of approval on program shortly, probably even before the Chicago meeting.

Gov. Robert Kerr of Oklahoma and Russell B. Brown, general counsel of Independent Petroleum Assn. of America, were scheduled to testify before Senate Banking and Currency Committee on oil price control as that committee considers extension of OPA's life.

Walter S. Hallanan, president of Plymouth Oil Co. and chairman of a special API committee, earlier had informed committee that present crude oil productive capacity is 300,000 b/d in excess of maximum requirements and asked that industry be freed from "strait-jacket" of federal price control.

Mr. Hallanan told committee that while prices most probably would rise a small percentage, there could be no runaway of prices because there is ample supply to meet all foreseeable demands of the consuming public.

An agenda of persons expected to attend the meeting Friday and Saturday in Chicago has been announced by OPA. Those invited are:

Members of Petroleum Products Industry Advisory Committee for Dist. 5—George B. Hargons, Standard (California); Ralph Forch, Wilshire; William J. Demartini, Los Angeles.

Member of East Coast Fuel Oil Industry Advisory Committee—A. J. McIntosh, Socony-Vacuum.

Full membership of National Crude Oil and National Refiners Industry Advisory Committees.

OPA—J. H. Reppert, associate director of Fuel Price Division; E. L. Jones, petroleum price executive; Benjamin Elenbogen, chief counsel, Petroleum Branch; E. F. Fitzpatrick, head of refined Products Section; H. A. Peel, policy assistant; P. A. McKenna, head of Crude Oil and Gas Section; L. H. Noble, director of Services, Accounting and Audits Division; Malcolm S. Jones, Office of Industry Advisory Committees; E. R. Renfro, head of regional petroleum unit, Dallas regional office.

Other government agencies—M. K. Wells, manager of Bunker Fuel Section, WSA; Capt. Burton B. Biggs, deputy executive officer, A-NPB; Richard M. Bissell, acting deputy director, OWMR; Michael J. Deutch, special assistant to director, OWMR.

Present Inflation the Result Of OPA, B. A. Hardey Charges

Special to NPN

ABILENE, Texas—Charging that the present inflation is the result of OPA, B. A. Hardey, Shreveport, La., president of Independent Petroleum Assn. of America, asserted that "it is a sad situation when some appointee of the federal government can try to convince the people that accredited representatives of different segments of industry can't come to Washington to protest to their representatives against unfair and impractical regulations."

Mr. Hardey, addressing several hundred oil producers at a banquet here, was chief speaker at the re-activation of West Central Texas Oil and Gas Assn. Part of his speech was in answer to charge made by Stabilization Director Bowles that minority lobbies were hurting businessmen and that the House-passed OPA bill will bring inflation.

"In my opinion the inflationary forces now existing have been caused by the present administration itself through its policy of increasing the purchasing power of the public and the same time imposing wartime controls into the postwar era which restrict production.

"The government's fiscal policy and its apparent refusal to recognize the necessity of balancing the federal budget is one of the largest contributing factors to inflation."

Mr. Hardy predicted that price controls on the petroleum industry would be lifted by June 30, but at the same time blasted OPA for delay in lifting these controls and failure to allow increases in crude and product prices as recommended by the industry advisory committee.

Another speaker was Harold B. Fell, Ardmore, Okla., executive vice president of IPAA, who called upon the group to support a national policy program recommended to the Senate Committee Investigating Natural Resources.

Oil Men Eligible to Join New Tool OWNERS Union, Organized to Demand Equal Rights in Bargaining

FORMER Oilman Fred C. Clark gave the oil industry a new and most important thought when he addressed the National Petroleum Association, of which his old company had been one of the organizers, at Cleveland the other week.

Ex-Oilman Clark said—

1—that stockholders of companies are owners of the tools of business which individual workmen use to make their individual profit, and that such profit—or wage—depends not just on the skill with which those tools are used but on their high efficiency, which has been developed by their owners, and that

2—these tool owners are entitled to a fair wage for their tools which wage should be considered just as much a legitimate charge to expense as are the wages of the men who use the tools; and

3—why should not the owners of these tools organize and bargain collectively with those workers who would use the tools for their own personal profit.

Mr. Clark was talking as the general chairman of the American Economic Foundation of New York whose purpose is to clear up some of the thinking regarding industrial and economic problems. At the moment he was arguing that if both parties to wage disputes understood clearly their positions and used accurate language, such disputes would be ironed out much easier.

In talking with Mr. Clark and following back to the start of this "tool owners" idea as another name for stockholders, one encounters a most interesting and highly important development that seems to have started quite by chance last December and is growing rapidly right now. It is an idea that NATIONAL PETROLEUM NEWS has long advocated for the oil industry but for some unknown reason some people seem unable to think that anything can be done for the industry's public relations problem except to spend millions of dollars advertising to "the consumer."

The current presentation of the idea seems to have the handle that may make its value and its use easily apparent to all and that is why the idea is growing like wildfire.

In Lexington, Mass. lives Allen W. Rucker, a business management specialist who has his own firm in that line at Cambridge, Mass. Mr. Rucker has been calling company stockholders "Tool Owners." Last December on a local radio he forecast that in view of the then highly irritated conditions between employer and employe and employer and government, that the Tool Owners should form a "union" and demand "equal bargaining rights." Five thousand copies of his speech were requested and he was swamped with approving telephone calls. Since then he has developed this idea in full page advertisements in the Lexington MINUTE-MAN.

The result is that he is now president of the TOOL OWNERS UNION, national headquarters at 1802 Massachusetts Avenue, Lexington, Mass. with a staff of officers, a firm of auditors to check the cash, a depositary, the Lexington Trust Co. and so many demands coming in for literature with which to organize "union locals" that Mr. Rucker is unable to carry the expense of the enterprise anymore and is asking all who believe in the idea to join him with some of their cash, small amounts preferred and no one for more than $100. You can be a Regular member for $1, a Contributing member for $5 and a Supporting member for $10. You are asked to carry your "Union Card" and join in the idea back of the slogan "There is some one more powerful than anyone of us, and that is everyone of us."

In applying for your "Union Card" you "certify that I am an American citizen, and am not an elected or appointed Federal or State office-holder, nor an officer or employe of any organization hostile to the purposes of the TOOL OWNERS UNION." That rather bars the Communists, the pinks, the bureaucrats and, one might say, prehaps even all of the New Dealers.

The "Principles for Action" to which you subscribe are,

PRINCIPLES FOR ACTION

WHEREAS,—Tools of production are the very foundation of America's strength and material welfare; and

WHEREAS,—without these tools, workers could produce barely enough to exist; and

WHEREAS,—these tools come into being, are renewed and added to only through the thrift and self-denial of some fifty million individuals; and

WHEREAS,—the fundamental human right of bargaining belongs to the tool OWNERS (who provide the mechanical energy of production) quite as much as it belongs to the tool USERS (who provide the human energy of production); and

WHEREAS,—it has for many years been the persistent policy of government to violate this right and to discriminate against these fifty million unorganized tool owners in order to attract the political support of the leaders of organized tool users; and

WHEREAS,—this government policy has undermined the fundamental human right of the tool owners to receive payments for the use and renewal of the tools, has dis-

READERS' comments and opinions will be much appreciated by Warren C. Platt, NPN's Editor and Publisher, Penton Building, Cleveland 13, Ohio.

couraged additions to the tools, and has obstructed the growth of production to the detriment of all; therefore

Be It Resolved

1. That the fifty million tool owners organize for the purpose of regaining equality before the law, reasserting their fundamental human right to enjoy the fruits of their labor and self-denial, and re-establishing their position as the primary source of the workers' productivity and prosperity; and

2. that for the attainment of these objectives, the organized tool-owners engage in such action as is appropiate to the protection and advancement of their interests; and

3. that such action be applied to all political parties alike and that the fundamental soundness and fairness of the tool owners' position be impressed upon all candidates regardless of their political affiliations; and

4. that such action is in primary interest of the nation, of the people in general and of the workers in particular.

Who are "Tool Owners" is defined by Mr. Rucker as follows,

DO YOU KNOW THAT . . .

You are a tool owner if you have a savings bank account. Over 45 million people have such accounts and over 70% of bank deposits are invested and loaned by banks for "tools of production."

You are a tool owner if you have an ordinary life insurance policy; over 40 million people have such insurance and over 80% of insurance assets are invested in productive property, i.e., tools.

You are a tool owner if you are among the 8 million voters who own stocks and bonds. For it is your money in these investments that goes into tools used by corporations—and you can easily lose that money unless you bargain for fair payment for the use of your tools.

You are a tool owner if you are among the 9.8 million people who are owners or partners in unincorporated firms. Your savings are tied up in furniture, fixtures, delivery trucks and other tools you use to make a living.

You are a tool owner or a trustee of tools if you are a church pastor or officer of a college or school or even a charitable organization. For endowment and trust funds are only as good as the income earned by payments for the use of tools such funds have helped to buy. It is YOUR church, YOUR school, YOUR charity that suffers from stoppage of production.

You are a tool owner if you are among the 13 million women who receive income from life insurance and other property—and it is YOUR welfare that depends on payments for the use of whatever tools that money is invested in.

Remember—there is some one who is a more powerful protector of productive property than any one of us —and that is everyone of us. Hence a Tool Owners Union to speak, work and act together gives us the most powerful force known to safeguard the nation's strength and the welfare of all of us.

So every oil man with a dollar invested in his business, or any other company, in insurance or on deposit in a bank is a "TOOL OWNER." The oil industry, according to a survey made some years ago by NPN, has more than 1 million "tool owners" and this is outside of the "members" of the "co-ops." Yet unfortunately these oil industry "Tool Owners" have never been made conscious of their ownership of the oil industry. They and those they elect to manage their "tools" have, by their silence, let many of the public believe that the owners of the oil industry live at "26 Broadway" or "in Wall Street."

Some of the major company criticism of the oil "co-ops" we have never been very sympathetic to because the critics refused to see that one of the strong points of the "co-ops" is that their skillful promotors, and they are expert promotors and don't mistake it, have made and kept their "members" highly conscious that they actually own these co-op enterprises. That consciousness comes partly from breaking the co-op movement down into county oil companies, with large boards of directors, monthly meetings of those boards and frequent meetings of the members where the conduct of the companies is discussed in detail. It may be rather hard on the local management, to be picked over for every dime spent by the probably usual precentage of critics that you find in any group, but it certainly has caused a large number of the "members" to be always selling the company and the co-op idea. Major oil companies, with all the way from 25,000 to 160,000 stockholders—the number of the Standard of New Jersey, have had every opportunity over a great many years to educate and enlist the active participation of their stockholders in really "owning" their company. But for most years the stockholders were treated as strangers. Of late they have been sent a few more slips telling them to buy the company's products, and in the past few years some companies have sent stockholders elaborate and highly instructive annual reports and house organs.

But it is going to take more than the oil companies have done to arouse the "Tool Owners" of the oil business to fight the encroachment of bureaucrats, totalitarians, communists etc., successfully. Maybe the catchy homely phrase of Mr. Rucker's organization will do it.

At least that name puts the "Tool Owners" in the immediate position of saying to the workers unions, "Here, these are MY tools and they are good tools and cost me my hard earned savings, but what are you doing with them? You have to produce for ME a fair rental to use them and to do that you will have to use them both efficiently and for a reasonable number of hours a week and at only a reasonable return to yourselves so the products can find a market."

This phrase at once puts the shoe on the other foot in talking to "labor" and in a way that labor should have no difficulty of understanding. It brushes aside false propaganda about "capitalism" and "profits."

Also, the idea might develop far enough to convince the Internal Revenue Bureau and Congress that the rental to the TOOL OWNER for his "tools" is a legitimate charge to expense along with the cost of the labor and supplies.

Lexington, Mass. produced the "shot that was heard round the world," and aroused private citizens to become the "Lexington Minute Men" at a crucial time in this country's history. So perhaps this "Tool Owners Union" idea will rally 50,000,000 people who will fight for what they have earned and what they will keep against all comers and, may be another of Lexington's great gifts to mankind.

Editor's Note—As to the reliability of Mr. Rucker and his TOOL OWNERS UNION, the Boston Chamber of Commerce in the April issue of its house organ ran a long and highly approving story of him. March 25, he talked to the Personnel Managers Club of the Boston Chamber and there was introduced by L. Clayton McKenney of the Hood Rubber Co. One of the Board of Founders is R. E. Desvernine, New York attorney and former president of the Crucible Steel Co.

State oil marketers associations might well study this idea to see if they should not organize in each state a TOOL OWNERS UNION, State Local No.— for Oil Marketers. The producing and refining associations might consider the same idea.

Small Refiners, Jobbers Eye Export Market For New Business

NPN News Bureau

WASHINGTON—That small refiners, and even jobbers, are eying export markets as a possible means of expanding their operations is indicated by correspondence flowing into the new petroleum section of the Office of International Trade.

More than half of all letters to the new section are from independents and jobbers seeking information as to just how they can enter the export field. The replies were in answer to the section's letter-poll of industry members on what their future needs will be in regard to foreign trade.

"We'll handle each case individually," said James H. Mayes, director of the petroleum section. "If we do not have the information in Washington, we'll write to petroleum or commercial attaches in various countries and get it."

When a small refiner, who has not previously engaged in foreign trade or whose export activities have been interrupted by the war, writes Mayes' office about possibilities of getting into export business, he is sent a copy of Commerce Department's booklet on "Channels for Trading Abroad." Mr. Mayes also writes the refiner to determine exactly what he has to sell, how it is to be packaged, which countries he prefers to do business with and by what method he plans to market his product.

The refiner is asked specifically whether he wants to have his own salesman go abroad or whether he wants to deal with American export houses, foreign import firms, an American travelling agent or with foreign commercial missions currently in the United States.

Mr. Mayes is preparing a complete list of all foreign commercial missions in this country, the type of petroleum products in which they are interested and where they can be contacted. The list will be revised, he explained, from time to time and will be available to those requesting such information.

Before taking his present job, Mr. Mayes was a member of the export-import control licensing section of the government. Prior to entering government service in 1942, he worked for 15 years in foreign and domestic phases of the oil industry.

Drake Well Memorial Park Curator Speaks at Dinner

Special to NPN

TITUSVILLE, Pa.—Dr. Paul H. Giddens, curator of Drake Well Memorial Park was principal speaker at a testimonial dinner of Titusville Chamber of Commerce April 23.

Dr. Giddens reviewed the establishment of the park and outlined development of the petroleum industry's memorial shrine. He asserted that the library and museum at the park is the finest, greatest and best center for the study of petroleum history in the country. He said that definite plans were under way for still further improvement.

More than 200 attended the testimonial dinner, and heard addresses by local leaders, including the mayor, president of Chamber of Commerce, and Charles B. Stegner, president of the Drake Well Advisory Board.

Refiners Get Choice of Base Year in CPA Tin Can Order

NPN News Bureau

WASHINGTON—In amendment to CPA container order (M-81), packers of lubricating oils, including motor oils, will be allowed to use tin cans up to 100% of amount used in either 1941 or 1945.

CPA also revised order to include following items which were "inadvertently omitted" in March 1 issue of regulation: abrasives and valve grinding compounds, boiler sealing compounds, gasket assembling compounds, buffing compounds, caulking compounds, graphite with liquid content, lubricating greases, solder paste and welding fluxes.

Packers of all items mentioned above have option of using either 1941 or 1945 as base period on which to calculate 1946 packing quota. Order previously designated only 1945 as base period.

Committees Named for API Meeting in Shreveport, La.

NPN News Bureau

NEW YORK—Committee assignments for the spring meeting of Southwestern District, Division of Production of API have been made by W. E. Winn, Sun Oil Co., Dallas, district chairman.

Hosts for the meeting, which will be held at Washington-Youree Hotel, Shreveport, La., May 17-18, will be Ark-La-Tex Chapter of Production Division, of which B. J. Dowd, Union Producing Co., Shreveport, is chairman.

The General Committee on Arrangements includes:

Chairman: H. C. Anderson, Texarkla Oil Corp., Shreveport.

Members are: Lon Abney, The Texas Co.; J. Pat Beaird, J. B. Beaird Co.; M. R. Brinkerhoff, National Supply Co.; F. W. Brunner, Carter Oil Co.; H. B. Clifton, Magnolia Petroleum Co.; R. O. Farley, Ohio Oil Co.; J. T. Goodman, Gulf Refining Co. and B. A. Hardey, independent; all of Shreveport; H. B. Johnson, Haynesville Operators Committee, Haynesville, La.; T. W. McGuire, Cotton Valley Operators Committee, Cotton Valley, La.; N. C. McGowen, United Gas Corp.; L. M. Moffitt, independent; A. Olin Price, Brewster Co., Inc.; John Reynolds, Sohio Petroleum Co.; W. L. Stanton, Carthage Field Engineering Committee; J. M. Starke, Southern Production Co., Inc.; A. H. Weyland, Arkansas Natural Gas Corp.; and E. N. Wood, Continental Supply Co.; all of Shreveport.

Architect Service Offered by Phillips To Aid Housing

NPN News Bureau

CLEVELAND — Phillips Petroleum Co.'s management has developed a housing plan for employes that is proving successful in its headquarters city of Bartlesville, Okla.

Five architects were assigned to handle the job of arranging for two-room or more apartments in the city's residences. The services of the architects were offered free to anyone who would give first preference on the remodeled quarters to Phillips employes.

Two weeks after the plan was inaugurated about 40 applications were received, and a number of deals suitable for remodeling were submitted.

Phillips printed combination announcements and applications and asked employes to place them in the hands of property owners who might be in position to participate in the plan. These were also placed in lumber yards, real estate offices, banks and home savings institutions. Returns are still coming in.

The announcement, with a head reading "Will you remodel your home, apartment, or other quarters to provide additional rental rooms or apartments," offers the following free services to interested property owners:

1. Consultation service by a recognized and experienced architect.
2. Architectural preliminary sketches of the project.
3. Cost estimates.
4. Financing information.

"All these services are yours without charge if you will agree to give Phillips employes registered on the company's housing waiting list first preference when the additional quarters become available for rental", the announcement states.

The application reads:

"In order to provide rental housing in Bartlesville in the form of remodeled apartments or rooms, I desire to avail myself of the free preliminary architectural service and rough estimate of the remodeling cost made available by Phillips Petroleum Co.

"I will give preference in renting the additional facilities to Phillips employes in accordance with the waiting list maintained by the Employe Relations Departments of Phillips. Should my remodeled facilities not be rented promptly by the person or persons referred to me by Phillips, then I understand I may rent to anyone."

Phillips officials point out that while this plan is not offered as a complete solution to the housing problem, they believe that a similar plan, perhaps sponsored by the Chamber of Commerce in larger cities would be of some help in relieving the current shortage.

Washington—By Herbert Yocom

Incentive Proposal a Step Toward Strong Domestic Oil Industry

WASHINGTON—No better case for a strong domestic petroleum industry has been made out in a long while than that which Sen. O'Mahoney of Wyoming presented this week to Interior Secretary Krug in urging that the department give support to an incentive program that will *really* stimulate exploration for oil on the public domain.

Mr. Yocom

Along with Sen. Hatch of New Mexico, Sen. O'Mahoney is sponsoring a revision of the Mineral Leasing Act which, among other things, would provide a flat royalty of 12½% on oil produced from new discoveries. This is the same rate authorized for the period of the national emergency, but the Interior Department is opposed to it being written into the peacetime law because the need for "encouragement (of exploration) in normal times is not apparent."

With this viewpoint, the Wyoming senator takes vigorous exception. He argues logically, in a letter to Mr. Krug, that anyone who thinks that these are "normal times" with respect to petroleum completely ignores the plainest of plain facts.

Pointing to the shift of balance in the oil world from the Western to the Eastern Hemisphere and to explosive conditions in the Near and Middle East which could make operations in those areas by American companies "turn out to be an investment in Armageddon," Sen. O'Mahoney states that the U. S. must do "everything in its power to promote the search for new oil deposits within its own boundaries, so that come what will upon the international scene, it will not be dependent upon any foreign source of oil." We cannot afford, he adds, "to risk either industrial or political leadership and both are closely associated with the maintenance here in the U. S. of ample oil reserves."

The argument is irresistible. It ought not only to be heeded by Secretary Krug but also by others in government such as Chester Bowles, who seems not one whit concerned whether there is ever another barrel of oil discovered anywhere in this whole great country, on public lands or private.

° ° °

NOTE: While Interior Department is on record in opposition to flat royalty, the department position was adopted while Harold L. Ickes was still in the saddle. It's Sen. O'Mahoney's hope that Secretary Krug will see things differently, which is why he now wants the latter to review the matter and then join with the Senate Public Lands Committee to continue and expand the wartime incentive program.

Midwest—By Earl Lamm

High Finance Removes Co-Ops from 'Small Farmers' Class

DETROIT—The co-ops are increasingly modest when answering arguments concerning their favorable tax position as we have heard them do on several different occasions in the Midwest recently. The latest occurred during the Michigan jobber convention here last Wednesday. (See p. 28).

Mr. Lamm

It is not unexpected that they should desire to retain their present tax exemption status simply as a matter of good business — for them. Even the co-op whose proclaimed philosophy of life is based upon a brotherly interest in his fellow man, can be expected to be a little selfish; but let's look at the record as a matter of accuracy and balance the budget of brotherhood as a whole, that is, with the non-co-ops.

Invariably, the first reply of modest co-op spokesmen we have listened to has been: "We're just a group of small farmers." They haven't the slightest idea of becoming so big that all income taxpayers will be eliminated. This meekness and modesty, however, is reserved for oil jobber meetings and others of similar nature.

Front page headline in the April 16 issue of The Co-operative Consumer published at Kansas City reads: "Calls Co-ops of World Huge Sleeping 'Gulliver' ". The story is by Wallace J. Campbell, head of the Co-Operative News Service in New York, which supplies copy to all member publications nationwide, including the 20 large regional co-ops and numerous smaller ones in the Midwest and Canada. It reviews the extensive status of U. S. and world co-ops as reflected in the headline, and is a fair example of co-op publicity and ambitions.

Wally Campbell is a young, red-headed newspaper man. Our personal acquaintance and observation of him in action on trips to the Midwest is that he is an aggressive, capable and experienced reporter. Consequently, we have every reason to believe that the co-op story he constantly tells is much more accurate and thorough than the local versions presented at oil jobber meetings. Co-op spokesmen at the state oil jobber conventions usually have only a local community or small area viewpoint. They can in all earnestness say, "We're just a group of small farmers," because that's what they usually are.

Oil jobbers and other small business men have frequently stated "So far so good!" It is the aggregate of the many small groups summed up in income tax-free action through the big regional co-ops like Consumers Co-operative at Kansas City, then carried even higher through National Co-Operatives at Chicago, which alarms oil marketing.

During the past few months it has been rumored that Howard A. Cowden, head of Consumer Co-Operative, was about to abandon his tax exemption privileges and get on an equal footing with private business in order to locate more of his service station outlets in larger towns and cities. Should that come to pass, we would like to be among the first to congratulate him upon balancing his budget of human interest as a whole. It is not known whether this story has any connection with another rumor of recent months that the co-ops country-wide are preparing to open 10,000 retail outlets for automotive supplies.

According to Bertram B. Fowler in the April 20 issue of Collier's magazine, the U. S. co-ops got started in 1921 with a handful of worn nickels . . . and in July, 1943, had garnered enough nickels to pay $5,000,000 for the Globe refinery in Kansas.

Internal Revenue figures, say co-op spokesmen at oil jobber meetings, show the total farmer co-op income exempt from tax is less than $20,000,000, and on the basis of 38% average income tax assessment, the co-ops would have paid less than $8,000,000 income tax annually . . . "an insignificant amount."

The information was of course passed down to the local spokesmen from higher up in the co-ops, but anyone who can really think of items like $5,000,000 and

$8,000,000 as insignificant, is himself no longer an insignificant little farmer.

Resolutions have been passed at most co-op meetings in the Midwest during the past few months calling for continuation of OPA, which would of course be done at the tax payer's expense, with private business carrying the heaviest load and the greatest restriction upon its price activities. Since the co-ops want OPA continued, they might at least contribute the "insignificant" little sum of $8,000,000 income tax now exempt toward the cost of continuing OPA.

While visiting with various oil men after the co-op discussion here last week, we were asked when something actually was going to be done about taxing the co-ops. The question will have to be referred to our honorable contemporary, Herbert Yocom in Washington.

Atlantic Coast—By Frank P. S. Glassey

Anglo-American Oil Treaty May Be Rewritten to Include Soviet

NEW PORK — Russia may yet be enticed into the orbit of the very tentative Anglo-American petroleum agreement, still awaiting Senate ratification, in the opinion of some oil men here. The best current guess is that the pact, in its present form, may never be brought before the Senate Foreign Relations Committee. Instead, it may be re-written to include the Soviet Union in a Big Three Treaty.

Mr. Glassey

It may be recalled that these pages early in March revealed, for the first time in this country, that British Foreign Secretary Ernest Bevin had told the House of Commons that he would be "quite willing if the Soviet would join us in the oil agreement as an international agreement, because that would solve the conflict over oil as between the great Allies forever."

When Mr. Bevin made that statement, Tom Connally, chairman of Senate Foreign Relations Committee, was in London. Sen. Connally is now in Paris, attending the conference of the Big Four foreign ministers. Perhaps he has discussed oil with Mr. Bevin. In any event, it is interesting to note that last week Deputy PAW Davies said that if Russia were a partner in the Anglo-American Oil Treaty, any international problems concerned purely with oil, in Iran or elsewhere, would be much easier to settle.

Mr. Davies has been the chief backer of the pending Anglo-American agreement, shelved temporarily while Senate considers the proposed U. S. loan to Britain. Replying to questions propounded by a Scripps-Howard reporter, Mr. Davies said he agreed with Mr. Bevin's statement of readiness to join a U. S.-Russian-British oil pact. He added:

"With reference to Russia, the fact is that the view of all of us has been, from the beginning, that all interested countries should be not only invited but urged to participate in an international agreement as to oil. This is particularly true as to the major oil-producing nations such as Russia, the Netherlands, Venezuela and others.

"Our reasons for starting with a bilateral agreement with the United Kingdom were two: First, there were problems of immediate mutual interest which called for solution; and, second, it seemed advisable to start with the relatively simple undertaking of a two-party agreement before attempting the larger project. It should be borne in mind that there is nothing in the Anglo-American agreement that is in the slightest manner antagonistic to Russia—quite the contrary."

The Associated Press has reported the administration pinned a "must" tag on Senate ratification of the agreement. But executives of some oil companies here believe Tom Connally will be in no hurry to bring it before the Senate Foreign Relations Committee. Sen. Connally is up for re-election in November and, while there is no danger of his losing his seat, the subject of the agreement is not exactly a popular one in his home state of Texas. It might be politically advisable, therefore, to postpone discussion of the treaty until after the elections.

Meanwhile (the guess is), Russia may be invited in to obtain the global touch. Should the current Paris conference of foreign ministers prove a fiasco, however, it is believed that the administration at Washington would back the Anglo-American agreement to the limit.

* * *

The Atlantic Coast Oil Conference has followed up the demand by the recent convention of Independent Oil Men's Assn. of New England that OPA price controls in the oil industry be lifted.

In a letter sent to all senators from the Atlantic Coast states, Clyde G. Morrill, executive secretary of the conference, asserted that an acute shortage of heating oils and bunker oil during the first two months of this year was the direct result of OPA's "refusal to follow the advice of its own advisory committee that reported on Dec. 5, 1945." Mr. Morrill added:

"There has been an approximate balance between supply and demand in the petroleum industry and such unbalance as may exist seems directly attributable to the inability of OPA to move expeditiously when emergency situation threatened.

"From our own point of view as small businessmen, OPA's continuance as an agency should be based on the prompt liquidation of price ceilings whenever any industry can show approximate balance between supply and demand. We cannot count on lucky breaks in the weather to forever protect our customers against suffering and loss.

"We ask that you give this due consideration when voting for OPA's extension."

Navy Looks to Oil Industry For More Technical Aid

NPN News Bureau

WASHINGTON—Due to separations of many technical men from service, subcommittees of Navy Co-Operative Committee on Fuels and Lubricants are being formed to evaluate boiler and Diesel fuels, turbine lubricants and their performance in Naval engineering through inspection of ships afloat and in Navy yards.

Technical subcommittee is being established to evaluate special fuels and lubricants from both petroleum and non-petroleum sources.

Navy hopes for wide participation by oil industry and engine manufacturers, but is seeking only working members technically qualified.

For its petroleum inspection service it wants professional and semi-professional men for posts in U. S. and Middle East, Caribbean and Philippine areas. Experienced petroleum engineers and trouble shooters will be given civil service appointments. Applications should be made to Code No. 331, Bureau of Ships, Navy Dept., Washington, D. C.

Service Station Sales Drop

WASHINGTON — Bureau of Census reports that February sales of 898 representative filling stations in the nation totaled $6,782,314 in comparison with sales of $7,440,711 in January, down 9%.

Use Molasses Tanks For Avgas Storage

NPN News Bureau

NEW YORK — Problem of storage of aviation gasoline for armed forces on the East Coast should be eased substantially as a result of leasing of 25,000,000 gals. of former molasses storage at Port Everglades, Fla., by Southeastern Oil of Jacksonville, Gordon Duke, president of Southeastern, said last week.

Mr. Duke explained he had an option on the entire terminal built in 1940 for Pacific Molasses Co. for the nationwide distribution of Cuban and Puerto Rican molasses. He has now leased to the Navy six of the ten 96,000-bbl. tanks on the property, which will be operated by the Navy for itself and AAF. Tanks have been cleaned and refitted at a cost of more than $30,000. The first tanker containing avgas was due to arrive at the terminal this week. After initial shipments are received, Mr. Duke said, a P-2 will move into the terminal about once every six weeks.

"Partially-filled tanks in New York, Philadelphia, Providence and elsewhere along the coast will be cleaned out and their contents stored at Port Everglades," Mr. Duke said. "This terminal, handling grade 130 avgas for both Army and Navy, will serve the entire area of Florida and part of southern Georgia. Gasoline will move out by barge, truck or tank car, whichever proves most economical. All Army and Navy avgas for the area will be concentrated in this terminal when stocks in other terminals are exhausted."

Mr. Duke said that 600,000 bbls. will be moved into the tanks initially. Thereafter they will handle 75,000 bbls. per month, with an annual turnover of about 1,500,000 bbls. His contract with the Navy runs for three years, with the provision that the Navy can cancel after one year, either tank by tank or month by month.

"This expansion," Mr. Duke added, "is in line with our company's policy of providing widened and improved service in the handling and distribution of petroleum products, both in the United States and abroad."

2 More Military Oil Officers Awarded Legion of Merit

NPN News Bureau

WASHINGTON—Two more military petroleum officers, Capt. W. C. Latrobe, USN, and Lt. Col. D. M. S. Langworthy, have been awarded the Legion of Merit.

Capt. Latrobe was cited for services in the Bureau of Ships as executive to the Research Branch, chairman of the Navy Department Specification Board and the Navy Co-operative Committee on Fuels and Lubricants and technical member of the Army-Navy Petroleum Board from the outbreak of hostilities to September, 1945.

Col. Langworthy received his award for his services as secretary of A-NPB from February, 1943, to February, 1946.

The citation accompanying Capt. Latrobe's award recites that, "Displaying exceptional initiative, judgment and professional ability in discharging the responsibilities of his assignments, Capt. Latrobe rendered invaluable service in the material development, technical coordination with other bureaus, the Army and foreign countries, and the establishment of petroleum inspection services and quality control procedure."

Of Col. Langworthy, the War Department said, "With tact, foresight and administrative ability, he furthered the work of meeting the services' petroleum products requirements, offering wise counsel, and performing highly valuable services during conferences with military and civilian agencies within the United States and abroad."

$100,000 Minimum Price Set on Sale of Small Steel Tankers

NPN News Bureau

WASHINGTON — Minimum price of $100,000 each has been set by Maritime Commission on sale of group of small self-propelled steel tankers.

Commission previously had put vessels up for sale under competitive bidding but rejected all offers as too low. Tankers were declared surplus by War Department.

Vessels have speed of about 9 knots, dry cargo capacity of 48.1 long tons, and liquid cargo capacity of 37,685 cubic feet. Approximate dimensions are 182 by 30 by 13 feet. One ship is located at Brooklyn, N. Y., and remainder at Charleston, S. C.

Offers can be submitted to commission's director of Small Vessel Division, Washington, D. C.

February Pay of Oil Workers Higher Than U. S. Average

NPN News Bureau

WASHINGTON—Petroleum industry paid refinery and oilfield workers hourly and weekly wages well above average hourly wage of $1 for all workers in manufacturing during February, Labor Department reports.

Average oil field worker in February received $1.29 per hour, worked 40.5 hours and received weekly paycheck of $52.45. Average refinery worker drew $1.36 plus per hour, put in 40.7 hours per week and was paid weekly wage of $56.25 compared with January, hourly wages of refinery and oil field workers increased 2.9 and 2.8%, respectively.

Story headed "Oil Workers Wages High" on p. 53, April 10 NPN incorrectly reported that average weekly wages of oil field workers in January were "up" $2.43 from level in November, 1945. Statement should have read wages were "down" $2.43 from November.

Fire Insurance Rate Slash A Saving to Kentucky Oil Men

Special to NPN

LOUISVILLE, Ky.—Kentucky Division of Insurance, through State Fire Marshal Clyde Smith, gave the oil industry of this state some good news last week. Fire Marshal Smith announced a number of new fire insurance rates, including a reduction of 25 to 50c per $100 of value on bulk oil distribution stations and 25c per $100 value for service stations. It is estimated this will mean a savings of $100,000 a year in insurance costs to the oil industry in the state.

Oil rate reductions accounted for almost half of the total reductions authorized.

California Standard Extends Annuity Credits to War Vets

Special to NPN

SAN FRANCISCO — Standard Oil Co. of California is expanding its program for employes returning from military service to include annuity credits. President R. G. Follis said eligible employes would be granted such credits, under oil company's retirement plan, for all the time spent in active military service.

He estimated liability to be assumed by company may total as much as $1,175,000. Under program, returning employes with a year or more of consecutive employment before entering military service will receive same annuity for the period of absence as though they had remained at work. They will make no contributions for the period.

Seek Surplus Tanker Anchorage

WASHINGTON—Failure to complete satisfactory negotiations for a permanent Reserve Fleet site at Beaumont, Tex., for anchoring surplus war-built tankers has forced U. S. Maritime Commission to make additional surveys in the Gulf area.

Forms Stockholders Committee To Elect Panhandle Directors

NPN News Bureau

NEW YORK—R. E. Muller, vice president of Panhandle Producing & Refining Co., has formed stockholders' committee for election at annual meeting May 14 of new slate of directors uninfluenced by Serge Rubinstein, international financier now under indictment on charge of making false statements to evade draft. Mr. Rubinstein is free under $500,000 bail, pending collection of further evidence in his case.

Mr. Muller said Mr. Rubinstein's right to control Panhandle ceased when he sold his dominant stock interest and stated publicly he wished to avoid embarrassment to company.

Mr. Muller's committee is filing proxy statement with SEC and will mail it to stockholders after meeting commission requirements. Group backing committee is said to own more than 150,000 shares of Panhandle stock.

Optimism Prevails at Oil Heat's Biggest Exposition and Meeting

Oil Heat Institute Condemns OPA Price Control; Sees Bright Future for Oil Burner Industry

By Paul Wollstadt
NPN News Editor

PHILADELPHIA—Oil heat put on the biggest show in its history here last week.

The National Oil Heat Exposition, sponsored by the Oil Heat Institute of America in conjunction with its 23rd annual convention, attracted more than 5000 industry people to Philadelphia's Commercial Museum. In addition, 50,000 non-industry visitors came to view the exhibits.

But the figures tell only part of the story. The rest is to be found in the confidence of those who came as industry representatives that oil heat is looking ahead to a period of immense development and in the enthusiasm for automatic oil heat of the thousands of present and prospective home-owners who saw the show.

The convention, held at the Benjamin Franklin Hotel, included annual meetings of the institute itself and of its Distribution and Accessory Divisions.

W. A. Matheson, vice president of Williams Oil-O-Matic Division of Eureka Vacuum Cleaner Co. at Bloomington, Ill., was re-elected president and A. E. Hess was again chosen managing director of OHI. S. H. Shipley, president of York-Shipley, Inc., York, Pa., was re-elected vice president.

Squeezed into the busy OHI business meeting was approval of a resolution calling for termination of OPA controls on all business. The theme of the discussion on the OPA resolution was that greater production would be a more effective antidote for inflationary forces than the regulations of the prime agency.

President Matheson said that OPA officials had made capital out of the fact that many of its opponents selfishly called for decontrol for their own industry, while willing to leave price ceilings on all other goods. This resolution should demonstrate, he said, that OHI has considered the best interests of the whole country.

Fred Beckwith, secretary of the New England Oil Heat Institute, added a request that industry members write direct to their own senators urging that price controls be dropped, while the Senate Banking and Currency Committee was considering the subject.

In another resolution, OHI pledged the engineering facilities and productive capacity of the oil heat industry to expedite the Veterans Housing Program.

Managing Director Hess, in his annual report, told that OHI membership is now at an all-time high. Among other activities of OHI covered in his report were: publication of a basic Oil Burner Service Manual, written for the Distribution Division by Technical Secretary G. T. Kaufman; a revision not yet completed of "Handbook of Oil Burning"; preparation of pamphlets "Why More People Burn Oil"; co-operation by the engineering committee in sponsorship of ASTM tests on fuels; plans for construction of a standard reference combustion test unit.

Sees Bright Future

Shortages, especially of fractional horsepower motors, still plague the manufacturing branch of the oil heat industry, but even so President Matheson predicted that Americans will purchase more than a billion dollars worth of oil heating equipment in the next five years, that there will be 4,500,000 motor-driven or power burners in use by 1950—2,000,000 more than today. He forecast also that in 1946 alone there will be an increase of 750,000 in the number of space heating units using oil.

Mr. Matheson scoffed at fears of a fuel oil shortage.

"If some of the oil shortage rumors were even partially true," he said, "the oil heating industry would now be holding a wake, instead of the biggest show in its history."

Mr. Matheson, at a discussional session Friday morning, said that the time has come really to sell prospects, not just accept orders when forced to do so. Every effort, he said, should be made to close an order no matter how remote delivery might seem at the moment, as manufacturers are setting up their production facilities to make five times as many units as formerly. He warned that there are too many duplicate orders in the files, adding that a year from now all actual back orders may be cleaned up.

During the Friday morning discussion, it was brought out that oil burner model changes are generally being held up in the interest of speeding production. Nevertheless, seven manufacturers did not exhibit this year because their new models are close to completion and they did not want to show the old ones.

Use of the OHI seal in advertising and on equipment was urged as a means of promoting the industry. Plans are now under way for use of the OHI seal by burner dealers who follow the new installation code of the Distribution Division.

The close tie between the sale of fuel oil and the sale and servicing of burners was in ample evidence on the exposition floor. Sample check interviews were made by NATIONAL PETROLEUM NEWS staff representatives The results were in line with figures represented by NPN in its oil heat survey of 1048 subscribers (NPN, Feb. 13, p. 26) which showed that:

Of the oil jobbers who sell over one million gals. of heating oil per year, 58% sell burners and 62% service burners.

Of the oil jobbers who sell between 250,000 and 1,000,000 gals. of heating oil, 25% sell burners and 34% service burners.

Of the oil jobbers who sell less than 250,000 gals. of heating oil, 29% sell burners and 26% service them.

Directors Elected

The following four new directors were elected by OHI:

Francis Gilbane, Francis Gilbane, Inc., Pawtucket, R. I.; Walter Schroeder, Milwaukee, Deep Rock Oil Corp.; Charles R. Holloway, Jr., Liberty Fuel and Ice Co., Portland, Ore.; A. E. Coburn, Fuel Oil and Oil Heat, New York.

The following were re-elected as directors:

P. R. Addams, Fitzgibbons Boiler Co., Inc., New York; A. T. Atwill, Quaker Manufacturing Co., Chicago; R. S. Bohn, Preferred Utilities Manufacturing Corp., New York; W. F. Brannan, Anchor Post Fence Co., Baltimore; C. R. Collins, May Oil Burner Division, Gerotor May Corp., Baltimore; J. F. Corrigan, Petroleum Heat and Power Co., Stamford, Conn.; Alexis Doster, Torrington Manufacturing Co., Torrington, Conn.; F. C. Haab, F. C. Haab Co., Inc., Philadelphia; G. E. Hochstein, Heating Equipment Division, The Heil Co., Milwaukee; J. A. Collins, Frontier Oil & Refin-

Highlights of OHI

On the following pages two NPN staff writers give readers a comprehensive report of happenings at Oil Heat Institute's record-breaking show in Philadelphia. Highlights of the convention and exposition included these developments:

Membership—OHI Distribution Division formulates new associate membership plan and drafts new burner installation code.—p. 14.

Sales—J. J. Nance, vice president, Zenith Radio Corp., tells convention sales methods must be revamped if industry is to keep stride with postwar selling—p. 18.

Catalytic Cracked Fuel Oils—Adjustment of burners to efficiently utilize new cat-cracked oils urged as goal of manufacturers—p. 20.

Fuel Tests—Report on ASTM tests of two types of fuel oils and new standards to be recommended—p. 20.

Carl R. Jonswold (seated, left), chairman of Distribution Division of Oil Heat Institute and vice president of Arrow Petroleum Co., Chicago, and F. B. Caldwell (seated, right), secretary of the division, discuss agenda for meeting of Distribution Division directors. Standing are the directors (left to right): Walter Schroeder, Milwaukee division manager of Deep Rock Oil Corp. and president of Wisconsin Oil Heat Assn.; Fred C. Haab, F. C. Haab Co., Inc., Philadelphia; Charles R. Holloway, Jr., vice president, Liberty Fuel and Ice Co., Portland, Ore., and chairman, Oil Division of Oregon Fuel Merchants Assn.; J. W. Warner, J. P. Agnew and Co., Washington, D. C.; J. A. Collins, Frontier Oil and Refining of Buffalo; Francis Gilbane, Francis Gilbane, Inc., Pawtucket, R. I. (NPN Photo)

ing Co., Buffalo, N. Y.; R. P. Johnston, S. T. Johnson Co., Philadelphia;

C. R. Jonswold, Arrow Petroleum Co., Chicago; M. L. Judd, Delco Appliance Division, General Motors Corp., Rochester, N. Y.; W. A. Kemp, Pump Division, Sundstrand Machine Tool Co., Rockford, Ill.; C. E. Lewis, Perfex Corp., Milwaukee; S. A. Loeb, Webster Electric Co., Racine, Wis.; W. A. Matheson, Williams Oil-O-Matic Division, Eureka-Williams Corp., Bloomington, Ill.;

J. W. Owens, Mercoid Corp., Chicago; M. A. Powers, Timken Silent Automatic Division, Timken-Detroit Axle Co., Detroit; G. R. Prout, General Electric Co., Bloomfield, N. J.; R. M. Sherman, Silent Glow Oil Burner Corp., Hartford, Conn.; S. H. Shipley, York-Shipley, Inc., York, Pa.; William B. Shirley, Airtemp Division, Chrysler Corp., Dayton, Ohio; J. H. Van Sciver, Bethlehem Foundry and Machine Co., Bethlehem, Pa.; J. W. Warner, J. P. Agnew & Co., Washington, D. C.

OHI Distribution Division Sets Associate Membership Plan; Drafts Installation Code

By Frank C. Sturtevant
NPN Staff Writer

PHILADELPHIA—At the annual business meeting of OHI Distribution Division held at Benjamin Franklin Hotel in Philadelphia April 23, Chairman Carl R. Jonswold, Arrow Petroleum Co., Chicago, announced new provisions in OHI by-laws for members not connected with local chapters.

For annual dues of $15 it will now be possible for fuel oil and burner dealers and distributors, located at points where no local chapters exist, to become associate members of OHI and to receive all the benefits and assistance formerly available only through incorporated local chapters. Applications for associate memberships can be sent either to F. B. Caldwell, secretary of the Distribution Division, 616 S. Michigan Ave., Chicago, Ill., or direct to Oil Heat Institute of America, Inc., C. F. Curtin, secretary, 30 Rockefeller Plaza, New York 20, N. Y.

Mr. Jonswold invited oil and burner dealers everywhere to join forces with other industry members for united promotion of oil heat. One immediate result of united action he said, was the completion of a standard installation code which he described as a first step in direction of raising performance standards of all oil heat installation jobs.

The code was prepared by a committee consisting of Mr. Jonswold, W. A. Mathe-

DISPENSING EFFICIENCY AS HIGH AS 99.9787%

. . . from drums equipped with VISEGRIP Closures

IT is the wish of all sellers and the hope of all buyers of liquids-in-drums that every drop, to the very last, will be recovered at the dispensing point.

Drums that are equipped with VISEGRIP CLOSURES come close to that objective, but they do not quite reach it—*nor do drums with any other closures.*

99.9787 per cent of the liquid contents of drums equipped with VISEGRIP CLOSURES would be dispensed, according to an analysis of dispensing efficiency by one of the world's largest producers of alcohol.

They found that 1.5 liquid ounces would remain in drums equipped with VISEGRIP CLOSURES, *after the* usual *process of emptying drums had been completed.*

1.5 ounces equal 0.0213 per cent of 55 gallons . . . 99.9787 per cent of the contents were decanted, normally.

At that rate and under those conditions, the liquid remaining in 4,639.3 drums would just fill one drum.

The heavier liquids would remain in somewhat greater volume, quite obviously.

A high, practical point of product conservation and delivery is attained when liquids are shipped in steel drums equipped with VISEGRIP CLOSURES.

Leak-proof sealing . . . traffic safety . . . and full-measure delivery . . . the characteristics of VISEGRIP CLOSURES, the all-steel closures for steel drums, *are available to all users of drums in the United States. Every drum manufacturer has a stock of* VISEGRIP CLOSURES *and is equipped with the Rieke Dies that will build the closures into drums.*

SPECIFICATION: *Drums to be equipped with VISEGRIP closures*

VISEGRIP
CLOSURES

developed and produced for more than twenty years by

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son, president of OHI, and W. A. Kemp, chairman of the Accessories Division of OHI. After consultation with the OHI Engineering Committee, the code had been approved he said, and would shortly be ready for distribution to members.

Mr. Jonswold also reported that 4000 copies of a basic oil burner service manual, written by G. T. Kaufman, technical secretary of OHI, had been sold by Distribution Division. Price and description of this manual can be had by writing Secretary Caldwell.

Describes Service Training Course

James C. Yeomans, West Coast chairman of the Distribution Division, described a 3-week service training course conducted by the Oregon association which had been attended by 75 men.

Joseph A. Collins, Frontier Oil & Refining Co., Buffalo, East Coast chairman, reported on the formation of new chapters in Long Island, Syracuse and Utica, and on plans for new chapters in Harrisburg and in many parts of New Jersey.

Francis Gilbane, oil burning engineer of Pawtucket, R. I., read the names of the Business Management Committee:

J. P. Childs, Oil Heat Inst. of Cincinnati, 100 Southern Ohio Bank Bldg., Cincinnati.

Charles Genge, Braun Bros. Oil Co., 812 Oak St., Winnetka, Ill.

E. F. Marquard, Allied Oil Co., Inc., 1700 Standard Bldg., Cleveland.

T. A. Brown, Sentinel Oil Co., Inc., New Rochelle, N. Y.

Mr. Gilbane offered services of his committee on any matters of interest to dealers, and urged that suggested topics for committee activity be sent to the nearest committee member.

H. M. Mottram, chairman of the Advertising Committee, discussed various methods of oil heat promotion conducted by local chapters and distributed samples of campaign material used in Milwaukee. One piece in particular was a well designed broadside illustrated with photographs showing the wide range of homes heated with oil, and contained 28 answers to oil heat questions together with a list of the members of the Wisconsin chapter.

Mr. Mottram urged that chapters put him on their mailing list so that he could receive samples of any local advertising used and gradually build up a specimen file from which advertising and promotion ideas could be made available to all. His address is: H. M. Mottram, Wisconsin Oil-Heat Assn., Suite 418, 622 N. Water St., Milwaukee, Wis.

Joseph A. Collins, Frontier Oil & Refining Co., Buffalo, N. Y., chairman of the Committee on Burner Installation & Service (also East Coast chairman) reported that burner dealers were confronted with many obsolete and impractical municipal codes and fire laws. He asked that a new joint committee be formed to consist in part of members drawn from his committee and in part of members from OHI Engineering Committee, all to work toward abolishing or modernizing obsolete codes.

Frank Spencer, former chairman of the Distribution Committee presented a list of nominations for the board of directors of the Distribution Division for the coming year, to be voted on at a full OHI meeting to follow. Mr. Spencer felt the new installation code could be made the basis for a big oil heat promotion drive, in which the Manufacturers Division and the Accessories Division should participate. Local chapters could immediately begin advertising the advantages of oil heat installed according to code standards. Funds of considerable size, he said, could be raised without difficulty for such a purpose.

During general discussion from the floor Ted Rowland of Philadelphia urged

U. S. and Canadian Oil Men Greeted at Institute Exposition and Convention

Miss Elizabeth Caldwell, daughter of F. B. Caldwell, Chicago, secretary of the Distribution Division of Oil Heat Institute, welcomes to National Oil Heat Exposition three oil men (left to right): Thomas Moore, J. H. Rae Oil Co., Rochester, N. Y.; J. Henry Jones, assistant plant superintendent for Socony-Vacuum Oil Co. at Syracuse, N. Y.; William W. Gordon, Rae company at Rochester. Rae oil installs and services oil burners through a subsidiary, Raeco Products. Mr. Gordon is a 25-year reader of NPN

Reed Reutlinger (seated), Combustioneer, Inc., Washington, D. C., greets three Canadian oil men at the National Oil Heat Exposition. Left to right, standing: P. Lowes, R. G. Dibble Co., Toronto; G. McMehen, Fuel Oil and Equipment, Ltd., Toronto; H. W. Franklin, Teator Co., Toronto. They were part of the more than 5000 industry representatives present. There were also 50,000 non-industry visitors who came to see the exposition. (NPN Photos)

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Truck service now is a bigger job than ever.

International Truck Service—the largest company-owned truck service organization—and thousands of International Dealers everywhere are at your service, no matter what make or model your truck may be.

Drive your truck in at the sign of the INTERNATIONAL Triple Diamond for truck service by truck specialists. No lost time, no lost motion. No tinkering, no guesswork. Swift. Sure. Economical.

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that an insulation job be sold along with every oil heat installation, to preserve the cost advantage of oil as compared with gas. This was uniform practice, he said, on all gas heating jobs. He felt it was a mistake for the local industry to coast along on its present lead of 80,000 oil burners to only 8,000 gas burners.

Walter J. Schroeder, division manager of Deep Rock Oil Co., Milwaukee, described some of the joint billboard advertising for oil heat undertaken in Milwaukee. Gus Burrell of Harrison, N. Y., commented on suggestions from others that refiners and manufacturers be asked to participate in advertising programs. Joint advertising, said Mr. Burrell, could and should be carried on by local chapters without outside help. Local chapters, he said, were well able to stand on their own feet, and if a big, impressive sum could not be raised, then he favored starting with whatever funds were available.

The business session closed with some comments by E. W. Miles, fuel oil manager Standard Oil Co. (Indiana), who assured members there need be no fear of a fuel oil shortage because of the swing to catalytic cracking process. Cat crackers, he said, make a good quality fuel oil and in the years to come refiners may find oil burners their best customer. Recent shortages of fuel oil in the east were partly caused by users who demanded kerosine out of habit. Supplies could have been increased by as much as 50%, he said, if they had been willing to use a blend which would have been entirely satisfactory for all but a few cases.

Mr. Miles added his voice to others urging that gas competition could best be met by a united industry.

Says Sales Methods Must Be Revamped To Sustain Business

By NPN Staff Writer

PHILADELPHIA—A reconversion of dusty selling methods was seen as the biggest problem now facing oil and all other industry, by J. J. Nance, vice president, Zenith Radio Corp., speaking before the retail sales session of OHI. Since 1929 fewer and fewer young men have been trained to sell, Mr. Nance said, and when the present "sales honeymoon" period is over our free enterprise system will need a lot of salesmen to create and maintain a sustained consumer demand.

Figures showing a total consumer demand for durable goods to the value of $43,000,000,000 were quoted by Mr. Nance, who added there is no need for consumer demand to recede when supplies increase as the public has liquid assets to the amount of $181,000,000,000 in the form of savings accounts, checking accounts and bonds, available to satisfy all its desires. American selling techniques in the form of mass selling and advertising created the conditions which won the war, he said, and they must prove their worth again or we will have government spending and government control.

There is a good chance that business men will again be in full control of business, Mr. Nance thought, as government men have not been too happy with the results they have obtained. But there should be an end, he felt, to the custom of cutting sales expense when business declines, and increasing it when business picks up. Such practices, he said, only intensify high and low points in business volume and help to bring on depressions.

He also warned of too lengthy a reliance on orders on the books, as there exists an unknown degree of order inflation, as a result of customers seeking scarce articles, and placing duplicate orders with several dealers. This is known to be the case in both the automobile business and the oil burner business, he said.

In a general discussion period, questions from the floor were answered by a panel consisting of:

Carl R. Jonswold, Arrow Petroleum Co., chairman; W. Wadsworth Wood, publisher, "Small Homes Guide;" William F. Kelly, vice president, The Pennsylvania Co.; Robert Gray, business manager, "Fuel Oil & Oil Heat;" Colman Mockler, assistant manager, fuel oil department, Shell Oil Co., New York; W. A. Matheson, OHI president.

In reply to questions panel members offered the following opinions:

Competition with gas heat should be met by more vigorous selling, according to one of the experts, who cited conditions in Minneapolis, where oil has a slight cost advantage, but is not being pushed as it is in Milwaukee where oil burners outnumber gas burners 4 to 1. Another panel member urged all possible refinements on each installation to make oil heat as fully automatic as it is possible to make it. He thought the cost of service should be in the price of the fuel at a flat rate of say 0.5c per gallon, rather than billed as an extra either on annual contract or by the call. He also felt high replacement charges for motors, pumps, control units, etc., a distinct selling disadvantage.

Figures were quoted to show reconversion units were now 70% of all oil burner sales, and the forecast was made that this would drop to about 50% by 1950.

Canvassing for oil burner prospects was approved by another panel member, who cited the instance of a San Antonio department store which now has a crew of 20 men on the streets hunting prospects for home insulation.

A forecast was made that the government housing program for veterans will succeed although greatly impeded by high land, labor and material costs. Members were told of a program being started by the National Retail Lumber Dealers Assn. sponsoring low priced home designs beginning with a 24 by 28-ft. floor area, with provision for later additions.

Floor plan financing for oil burner dealers could be handled by banks, said another member, if they understand the problems involved, and fit the financing to the dealer's sales potential over a three to five months period, and not to his net worth. Questioned on the advisability of a dealer handling his own time payment financing, and collections, he said banks

Discuss Future of Oil Heat During Exposition

Five oil men discuss the bright future of oil heat at National Oil Heat Exposition. Left to right: Albert Drager, Samuel L. Slutzky, S. S. Young, J. P. Finnegan and George Wood. Messrs. Drager, Slutzky and Wood are with the Peekskill Fuel Oil Corp. at Peekskill, N. Y., which just recently began sales and distribution of oil burners. Mr. Finnegan and Mr. Young are with Petroleum Products of Morristown, N. J., which handles all types of petroleum products and installs and services oil burners. All have read NPN since they started in the oil business, Mr. Finnegan having been a subscriber for 25 years (NPN Photo)

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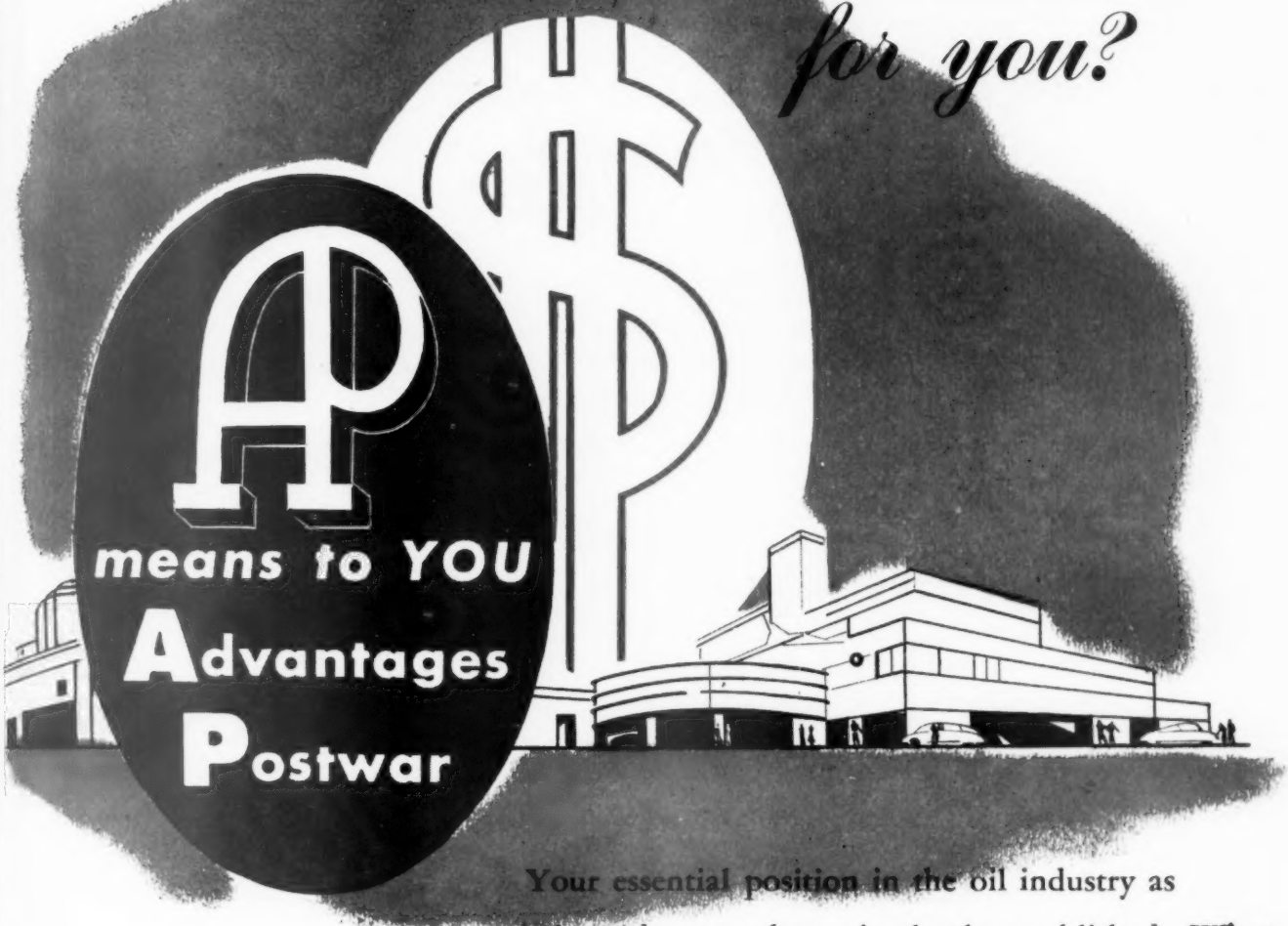

Your essential position in the oil industry as an independent marketer is clearly established. What you make of your business postwar depends a great deal, however, upon your refinery connection . . . Anderson-Prichard offers you: a dependable source of supply, foremost among independent producers and refiners; high quality products to meet the most exacting automotive requirements; active and faithful cooperation in developing your business as an independent. All of that spells . . . PROFITS!

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and finance companies could probably do it much cheaper and more efficiently.

Establishing any permanent government control setting a time limit on time payments was just as wrong as any other control, it was said. Best course would be for government to drop Regulation W at once and let time payment financing regulate itself, and set its own limits by normal competitive conditions.

Other statements made by panel members were to the effect that oil and burner dealers should always work together to sell oil heat; that burners could never be sold at cost to create oil business.

In discussing fuels, a possible future situation was seen, where there would be three common types of oil burner fuel offered for sale: kerosine; No. 1 oil for vaporizing pot type burners; and No. 2 for gun type burners.

Adjustment of Burners to Utilize Cat-Cracked Fuel Oils Suggested as Goal of Manufacturers

By NPN Staff Writer

PHILADELPHIA — Catalytically-cracked fuel oils will assume increasing importance in domestic oil heating because it cannot be otherwise if oil heat is to maintain a competitive position against gas and coal. Development of these new fuels may aid rather than retard the growth of the oil heat industry.

That is a summary of two papers presented at the engineering session of the OHI convention here, one by Arthur E. Pew, Jr., Dr. J. Bennett Hill and Dr. John R. Bates of Sun Oil Co., the other by William A. Sullivan, senior fuel oil applications and development engineer, manufacturing department, Shell Oil Co.

Sun Oil refinery executives dealt primarily with economic aspects of the effect of wartime refining developments upon fuel oil supply.

They opened their paper by saying that refineries could make fuel oil of any kind the burner manufacturers wanted, but that it would be "at a price." This price, they said, "might be such that if your burner owners were required to pay it, your customers would be putting in grates and gas burners and, as our former customers, buying coal and gas. It is purely a question of economics and this we cannot change, only OPA thinks it can do that."

"Economically and practically," they continued, "We must satisfy the gasoline consumer both as to quantity and quality and, of course, we must satisfy you (referring to burner manufacturers). We can do this and at the same time give the home oil burner fuel oil of high quality and with greater heating value per gallon,—provided the burner is designed to utilize it satisfactorily. Catalytic cracking produces the highest quality motor gasoline and at the same time a No. 2 fuel oil which is clean, noncorrosive and yields more BTUs per gallon on combustion. It is heavier and has a higher density or lower API gravity than virgin gas oils. As API gravity decreases the rate of combustion decreases and flame length increases. Adjustment of burners and burner design to this decreased combustion rate is the goal we suggest to you, in order to provide burner owners with better fuels which will also be competitive with coal, gas and gasoline."

Discuss Types of Fuel and Burners

The Sun men then discussed types of fuel oil and types of oil burners. They pointed out that kerosine and No. 1 fuel, being the highest in price of the distillate fuels, would be the last to be affected by competition with gasoline.

"Whether the refiner," they continued, "can afford to sell virgin oil as No. 2 fuel is dependent upon its value as a source of gasoline and how high the burner owner can go in price for his fuel,—remembering that he can always turn to coal or gas if oil prices go too high. The most disadvantageous situation for those burners which cannot burn low API gravity oil will be at maximum gasoline demand.

"Let us examine this case. At a time

Two Types of Fuel Oil Tested by ASTM; New Standards to Be Recommended

By NPN Staff Writer

PHILADELPHIA—A total of 34 laboratories throughout the country have completed tests of two types of fuel oil on four general classes of burners. Results of the test were summarized by M. A. Powers, chairman, Technical Committee E on Burner Fuel Oils of Committee D-2 of American Society for Testing Materials, and chief engineer, Timken Silent Automatic Division, Timken Detroit Axle Co., in a paper read before a meeting of OHI April 26.

The two types of fuel selected were designated for purposes of the test as No. 1 reference oil and No. 2 reference oil, but these numbers have no connection with grade numbers commonly used to identify commercial fuel oils. No. 1 reference oil was 80% straight run and 20% catalytic cracked, while No. 2 reference oil was 100% catalytic cracked. It was felt that the first grade represented what might be expected as a light fuel for pot type vaporizing burners, while the No. 2 reference oil represented the most difficult-to-burn fuel expected for use in power burners.

The test program, involving instructions to burner manufacturers, arranging oil deliveries, collecting and tabulating the results, was under direction of G. T. Kaufman, technical secretary of OHI. From results as reported in code form by Mr. Kaufman, the committee has concluded that neither of the oils is satisfactory for use in pot type burners, for the following reasons:

1. Excessive carbonization at the oil inlet to the pot.
2. Carbon and soot deposits in the pot and on the secondary surfaces.
3. A reduction in maximum BTU output capacity of the burner.

A reduction of oil input rate lessens soot and carbonization, but the deposits should be regarded as cumulative, or progressively increasing, with increased hours of operation.

Most of the tests showed that both fuels could be burned without trouble in high pressure, low pressure and wall flame rotary burners, with little or no modifications of burner or combustion chamber design, and with increased air flow to compensate for higher heat content of the fuel. Existing installations of rotary wall flame burners may require some changes in hearth design to burn No. 2 reference oil.

One laboratory questioned the proper operation of high pressure burners on short operating cycles. A blend of 70% No. 2 and 30% No. 1 seemed to overcome this difficulty without the need of burner modification, except in one instance where smoking conditions were reported even with No. 1 oil on a high pressure burner operating on short cycles in a warm air furnace. In this case the opinion was expressed by the testing laboratory that carbon would be built up on the heat exchanger and on the helix of the stack switch.

All the above data has been presented to the "Fuel Oil Specifications" Section of Committee E which now has the responsibility of recommending such changes in fuel specifications as they deem desirable. Their recommendations will then come before Committee E as a whole, for consideration, before final action is taken.

recor... the previous high o... 3,006,750 last October; New Haven 2,521,712, also a new high.

Hose Racks and Reels Reach Remote Fires

Supplied with hose up to 150 feet in length connecting carbon dioxide cylinders with discharge horn, Kidde Hose Racks and Reels offer a highly effective means of fighting fires over a wide area.

They are particularly useful in fighting flammable liquid or electrical fires too large for hand portables, but not large enough to require a built-in system.

Kidde Hose Racks and Reels can be furnished with one or more 50-pound cylinders of carbon dioxide. In addition to the release valves on the cylinders, a temporary shut-off valve is furnished on the discharge horn. Full details are available from Walter Kidde & Company, Inc.

...ording to assig... will go back to Shanghai. I want to return to China and still work with my company."

How to Make Fire KILL ITSELF

See how easily electrical and flammable liquid fires can be extinguished *—completely automatically.* Write for free 12-page bulletin, "How to Make Fire Kill Itself." Walter Kidde & Company, Inc. 545 Main Street, Belleville 9, N. J.

...library, auditorium, music room, gymnasium ... door swimming pool. One complete wing will be devoted to hospital facilities.

...eviously ...owledged that the separatis... were operating in Khamseh, armed with weapons which were distributed by unknown people.

Kidde

THE SIMPLEST WAY TO FIGHT A FIRE!

With a Kidde Hand Portable, you just aim at the fire and pull the trigger. Carbon dioxide capacities from 2 to 20 pounds.

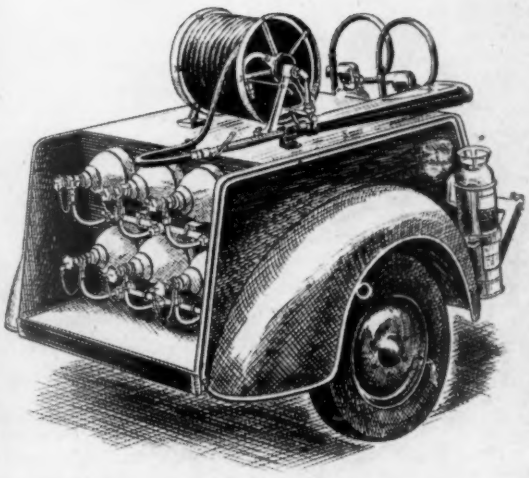
Mail and Phone Orders Filled

Kidde

AIMS STRAIGHT AT HEART OF FIRE

To kill flames fast, Kidde "local application" nozzles—supplied as part of built-in systems—aim the carbon dioxide discharge *straight* at the danger spot.

Kidde



Punch-packing Trailer

FOR INDUSTRIAL FIRE BRIGADES

Here's plenty of fire-fighting wallop in a compact unit that can be maneuvered through factory aisles. Just hook a Kidde Trailer Unit to a light truck—or even a motorcycle—and you're ready to fight fires practically anywhere in the plant!

Built to specification. A typical unit carries a hose reel with 300 pounds of carbon dioxide; two 15-pound carbon dioxide portables; two Kidde water extinguishers. Write for details.

The word "Kidde" and the Kidde seal are (K Kidde) *trade-marks of Walter Kidde & Company, Inc.*

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Strikers Snub 15-Cent ... Offer

General output at factories and mines decreased 4 per cent in October, while in the first half of November ... ...sic in...

Higher Pay Asked

...stationed in a little town in France for several months, wooed a French girl by telling her about ... the ... ... into

of maximum gasoline demand, refiners will, of course, wish to run all their cracking units. There is installed in United States 3,100,000 b/d of cracking charge capacity; 1,000,000 b/d of this is catalytic cracking equipment, the bulk of it built during the war years. When this catalytic equipment is all running, it produces about 400,000 b/d of cracked distillate meeting No. 2 fuel oil specifications. This distillate, which is excellent burner oil, is not competitive with virgin gas oil, as a source of gasoline, since it will produce only about 60-75% of the gasoline obtained from virgin gas oil at the same refinery cost per barrel of charge.

"The 3,100,000 b/d of cracking stock to charge these units must be separated from crude by fractionation. Let us consider the possible primary distillation products from the 4,400,000 b/d of crude we are now running, if we were to set out to make maximum charging stocks. To enable us to do this, we have reviewed the distribution of products which can be obtained from crude from all United States' fields on a country-wide sampling basis. This leads to the following average distribution of primary distillation products when so operating:

Fractionation of Average U. S. Crude To Prepare Maximum Cracking Stocks

Fraction	%	B/D	B/D Cracking Stks.
Gas and loss	1	44,000	
Gasoline and naphtha	19	836,000	Sold as such
Naphtha charging stk.	9	396,000	396,000
Kerosine, diesel, etc.	9	396,000	Sold as such
Light G. O. charging stk.	20	880,000	880,000
Heavy oil charging stock	32	1,408,000	1,408,000
Residuum, including fuel, lube oils, asphalt, etc.	10	440,000	Sold or used as such
	100	4,400,000	2,684,000 (61%)
Cracking capacity			3,100,000
Deficiency			416,000

"In this case, then, there would be not only no excess virgin gas oil for fuel but a deficiency of 416,000 b/d to fill the cracking units. To make up the deficiency, it would be necessary to run 5,100,000 b/d of crude, near our present upper limit of capacity.

"To make virgin gas oil to the extent of 50% of the required 400,000 b/d of home heating oils, would require a 5,900,000 b/d crude run, provided no additional cracking capacity were built. Best estimates do not predict such a crude run within the next 20 years.

"If the antiknock quality of gasoline continues to rise, the ratio of cracking capacity to crude capacity will increase, making the possibility of relying on virgin furnace oil even more remote.

Differences Between Two Explained

"How does the No. 2 fuel oil produced from catalytic cracking differ from the virgin oil? Here, we shall only discuss specifications.

"Cracking of an oil removes hydrogen preferentially and reduces the carbon to hydrogen ratio, thereby reducing the API gravity, as has been said. When virgin No. 2 is the charge, the gravity drops about 4 to 5 points. In the supply picture, which we have just shown, only a small portion of the cracking charge is in the No. 2 boiling range. Most of it is higher boiling. This high boiling, low gravity fraction of crude produces a No. 2 of even lower gravity. Since, in the future, furnace oil may be composed almost completely of catalytic distillate, except for such quantities as will bring the refiner sufficiently high price to justify its removal from cracking stocks, the following specifications are suggested as those upon which the design of burners should be based:

	Proposed	Present Com. Standard
API gravity	28-30	none
10% distillation	475° Max.	440° Max.
90% distillation	600° Max.	600° Max.

"The lower front end volatility is occasioned by the fact that catalytic gasoline, unlike thermal or straight run, retains its high antiknock quality up to the initial boiling point of the charge from which it is produced. The refiner will naturally wish to retain this high boiling fraction in gasoline.

"The operation of existing burners, and those to be manufactured in the future, on this type of fuel has been actively studied by Technical Committee E of American Society for Testing Materials with the cooperation of burner manufacturers in testing. The results released to date show that No. 2 fuel of the above specifications or even lower in burning quality, can be satisfactorily handled."

Takes an Optimistic View

Mr. Sullivan of Shell Oil said the work done at his company in the study of and experimentation with catalytic distillates "has lead us to take a very optimistic view."

"In contrast to and in spite of the widespread adverse publicity which has attended the introduction of catalytic distillates as burner fuels, we are convinced that their continued use will in no way retard but instead may actually accelerate the remarkable pace set by the industry so far in establishing oil in the public mind as most economical and generally satisfactory form of clean, trouble-free, automatic heat available. This is not mere wishful thinking. Our tests have shown that properly refined catalytic distillates as a class are actually superior in many respects to comparable thermally cracked and straight run distillates of which prewar fuel oils were composed."

He made the following observations about catalytic distillates:

Stability and Cleanliness—"Catalytic distillates are inherently cleaner and more stable with respect to deterioration in storage and formation of sediment than the average thermally cracked and many untreated straight run distillates."

Noncorrosive—"It has also been of interest to find by both laboratory and actual field performance that the catalytic fuels which we have examined thus far have shown no tendency toward corrosion of metallic oil burner parts, such as copper lines, pump seals, pressure regulating valves, etc."

Distillation Characteristics—"The overall effect of the change in distillation characteristics will be negligible from the standpoint of burner performance, except in the case of a relatively small group of critical vaporizing burners which require a very volatile fuel for quick lighting from a cold start."

High Heat Value and Low Viscosity—"The impression has become rather widespread that catalytic fuels as a whole are much heavier than prewar fuels. This point requires some clarification. If you are referring to the gravity of the fuel, then it would be correct to say that in general catalytic distillates are actually heavier, in the sense that they weigh more per gallon, than straight run distillates of comparable boiling range. This is a distinct advantage because the heavier the gravity of the fuel the higher it is in heat value. However, in viscosity, which is the most reliable measure of the ease with which the oil can be atomized, the difference between catalytic and straight run distillates can, for all practical purposes, be considered negligible. If any difference, the catalytic distillates will tend to run somewhat lighter in viscosity than straight run distillates in the same boiling range."

Low Pour Point—"In pour point, due to their higher aromatic content and lower paraffinicity, catalytic distillates have been found to run lower than their predecessors, which is still another point in their favor, since this should make for easier handling in extremely cold weather."

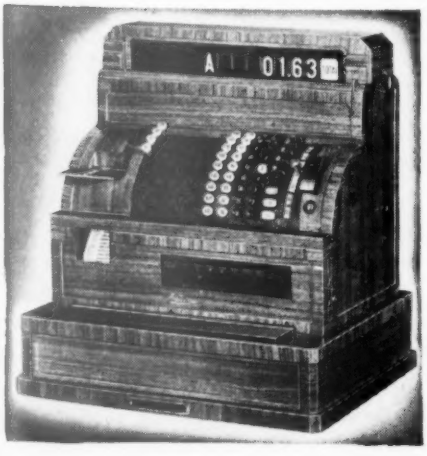
Burning Characteristics — "Catalytic fuels require more thorough mixing with air before combustion begins or in the early stages of combustion in order completely to ignite all of the free carbon that is split off during the combustion process. And if the oil burner is designed to provide the proper burning condi-

"I am 100% satisfied with my National Cash Register system"

"The National Cash Register System is the only one I have ever used that gives accurate and dependable information as to sales and expenditures. In regard to sales, I can compare one day with another, one week or one month with another. I can also tell where I am spending too much money, and in some cases, where I may not be spending enough.

"Another feature that appeals to me a lot is the fact that I can do all necessary checking, balancing, and bookkeeping within a few minutes each day. I do not hesitate to recommend this National Cash Register System to any business."

Call your local National representative—he's listed in your telephone book under 'N'. Let him show you how the right National Cash Register System will help your Service Station to handle more business, better.



See the National Cash Register for Service Stations

This National Cash Register is designed for use in service stations. It records sales made in each of five departments and identifies the persons who ring up the sales. It also shows amount of money paid out. In addition, the register prints a receipt on every transaction which shows the date, operator's initial, amount, department or kind of transaction, and the consecutive number of the transaction. A printed history of each transaction is provided on the detailed audit-strip.

Ask your National representative for a demonstration. The National Cash Register Company, Dayton 9, Ohio. Offices in principal cities.

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ACCOUNTING-BOOKEEPING MACHINES

tions, then catalytic fuels exhibit no greater tendency to smoke than straight run fuels."

Mr. Sullivan said the successful combustion of catalytic distillates in pot-type vaporizing burners requires that ample opportunity be provided for vaporization and thorough mixing of oil vapors with air before the fuel is exposed to the intense heat of the flame.

"You are obviously limited," he added, "as to the changes that can be made in existing pot-type burner installations, but tests conducted on a number of different burners of various makes indicated the performance of burners of this type can be greatly improved by maintaining a sufficiently high stack draft at all times and by operating at burning rates from 20 to 25% lower than the manufacturer's rating on prewar fuels."

Changes Relatively Simple

With vertical rotary burners, Mr. Sullivan noted, tests showed that "by simply raising the grills about two inches above their normal setting, thereby affording a slightly longer time for mixing of the air and oil before the combustion process began, it was possible to burn 100% of the catalytic fuel in question without a trace of smoke and without any objectionable carbon formation over a prolonged period of operation." Increasing the diameter of the fan also improved the performance of vertical rotary burners on catalytic fuels, he said. In both instances, Mr. Sullivan said that the changes were relatively simple.

Gun-type burners, according to Mr. Sullivan, were found to be "the least critical to the composition of the fuel of any type tested." Closer control of the air-fuel mixtures improved performance, both on catalytic fuels and on prewar fuels.

Mr. Sullivan predicted that the obstacles in handling new fuels satisfactorily in the majority of existing burners as well as in those of improved design "will be surprisingly simple to overcome" if the facts, "with regard to the advantages as well as the shortcomings of catalytic fuels, are thoroughly understood by all hands."

He assured the group that petroleum refiners consider fuel oil as "a valuable portion of their total business" and hence "would be the last ones to make any unnecessary moves which would tend to jeopardize" this market.

Comments following the papers included a reminder by Don F. Jones, chief engineer, Duo-Therm Division of Motor Wheel Products Co., that pot-type burners are used for the most part as space heaters, fill a low price demand, and should not be converted into some form of power burner because of fuel requirements.

It is of first importance, he felt, for makers of pot-type equipment to have definite information at an early date as to what type of fuel, at what prices, will be available for both existing units, and for new designs now being made.

Dr. L. C. Beard, Socony-Vacuum Oil Co., New York, reported his laboratories were working on a burner capable of using high carbon cat cracked fuels without difficulty and had great hopes of an early successful outcome. He felt that burner manufacturers would suffer if they tied their equipment to any fuel which might become hard to get or high priced.

A. W. Ruff, vice president, York-Shipley Co., also emphasized the need for continuing tests and research until a standard fuel of uniform characteristics could be assured.

Herbert Witte, Underwriters Laboratories, Inc., Chicago, said fuel testing results so far accomplished left no doubt acceptable solutions to all problems could be reached.

Stewart Hulse, Standard Oil Development Co., said the two fuels used in the series of tests were not necessarily the only types of fuels which refiners would be able to offer. Rather they were two extremes and some compromise between them would be the more probable result. He especially pointed out that the performance of fuel oil depends more on the care used in refining and blending, than it does on whether the oil came from the thermal or catalytic cracking process. Both processes in his opinion could turn out high quality fuel oils.

Suspicion was voiced by Arthur E. Pew, Jr., that some burners may have been inadvertently rated as satisfactory on No. 2 (commercial grade) fuel oil, because the oil actually supplied was No. 1 oil, sold as No. 2 oil. He pointed out that even though refiners continued to offer light fuel oils for present type burners, some manufacturers would certainly bring out new models to burn cheaper and more plentiful grades of oil, in which case products of other manufacturers would immediately be classed as "old-fashioned" and lose out in competition.

Difficulty in burning new fuel oils will be laid at the door of the oil industry rather than the burner men, according to M. A. Powers, who said that for the sake of public good will it was up to the refiners to see that suitable oils were made available no matter how produced. This did not mean, he said that burner men could take the stand that they could dictate the kind of oil which would be available in the future. He said it was equally their responsibility to seek design improvements to use the new oils.

Claim Burner Modification More Efficient for 'Cat' Fuel

NPN News Bureau

NEW YORK—Greater efficiency in operating non-mechanical types of domestic fuel oil heaters using catalytic fuel oil is claimed as result of burner modification developed by Socony-Vacuum Oil Co., Inc., and unveiled April 29.

Company estimates modified burner will operate for 10% less than original type and believes average householder, using 1000 gals. per heating season, could save $15 in cost of oil alone. Socony said it will not commercialize modification but will co-operate with manufacturers of pot-type burners in its further development, making experimental findings free to burner manufacturers.

Modification is expected to be ready for general use by 1947 heating season. It may be installed in burners already in use, new burners or those being converted from coal to oil. Research, carried on at Socony-Vacuum's technical service laboratories in Brooklyn, produced modification that makes possible use of No. 2 catalytic fuel oils, costing less than No. 1 straight run distillates and containing more heat units per gallon.

Petroleum Group of Retail Credit Assn. Meeting Is Set

NPN News Bureau

CLEVELAND—Program for the Petroleum Group here May 14-16 under the sponsorship of National Retail Credit Assn. in conjunction with the association's 32nd annual business conference at Hotel Statler, has been set up by A. E. Fletcher, credit manager, Standard Oil Co. (Ohio), who is chairman of the group. Co-chairman with Mr. Fletcher is Harry Butcher, credit manager, Cities Service, Chicago.

All forum discussions will be held in the afternoons from 2 to 5. Listed herewith are the topics:

Tuesday, May 14

Credit Cards—M. V. Johnston, assistant general credit manager, Gulf Oil, Pittsburgh.

Use of Credit Bureaus—William Stockton, general credit manager, Atlantic Refining, Philadelphia.

Wednesday, May 15

Training of Field Personnel—Arthur Xavier, Cleveland, division credit manager, Standard of Ohio.

Employe Selection of Credit Department Personnel—Frank Giesinger, Lincoln Electric, Cleveland.

Thursday, May 16

Domestic Furnace Oil Credit—James W. Marsteller, Cleveland, credit manager, Allied Oil.

Motor Carriers—W. H. Booster, division credit manager, Cities Service, Chicago.

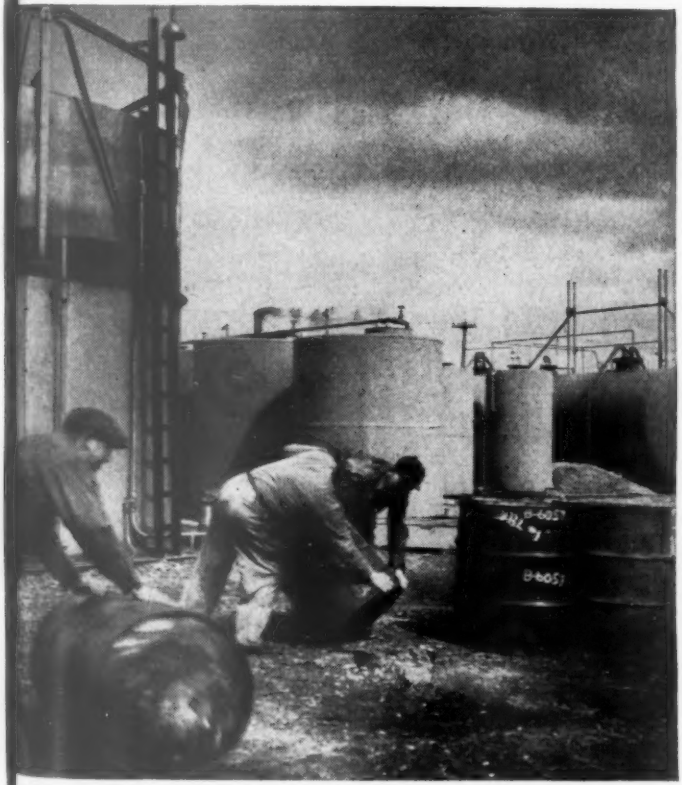
In addition discussions will be held relative to TBA, drum deposit accounts, farm accounts and jobbers.

Lubricants Group to Meet

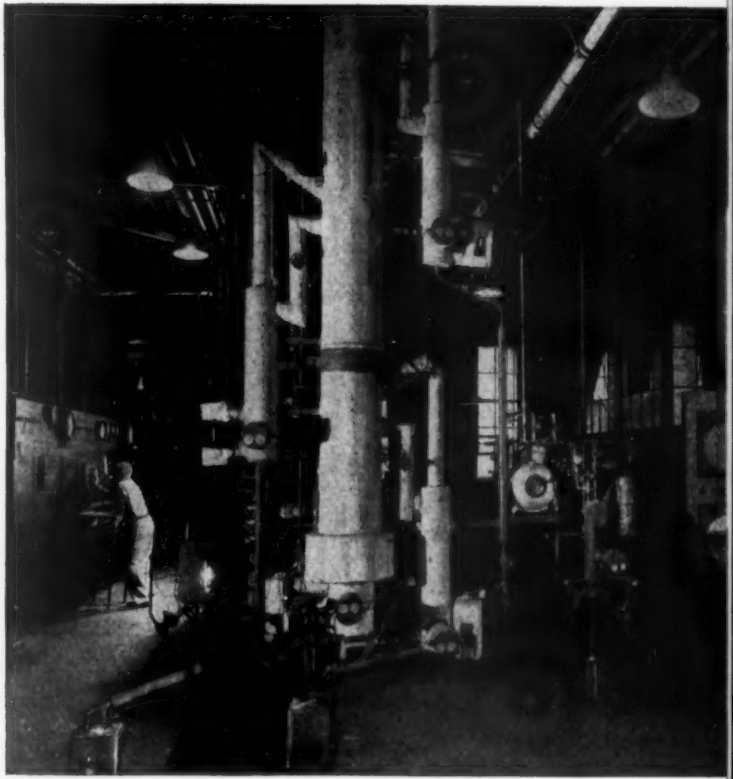
WASHINGTON—OPA has scheduled meeting of expanded National Lubricants Industry Advisory Committee May 13-14 in Chicago to consider possibility of eliminating lubricants from price control. New members of committee have not been disclosed, pending receipt of acceptances.

"Will decarbonizing improve the economic picture of our refinery when we install Fluid Cat-cracking?"

Refiners across the country must repeatedly find positive answers to such questions as this, on which depend major decisions. To provide sound, accurate answers, Kellogg years ago set up a system which has paid off for refiners. To understand its thoroughness ... and why it has received such wide acceptance ... it is only necessary to read through the following step-by-step sequence.

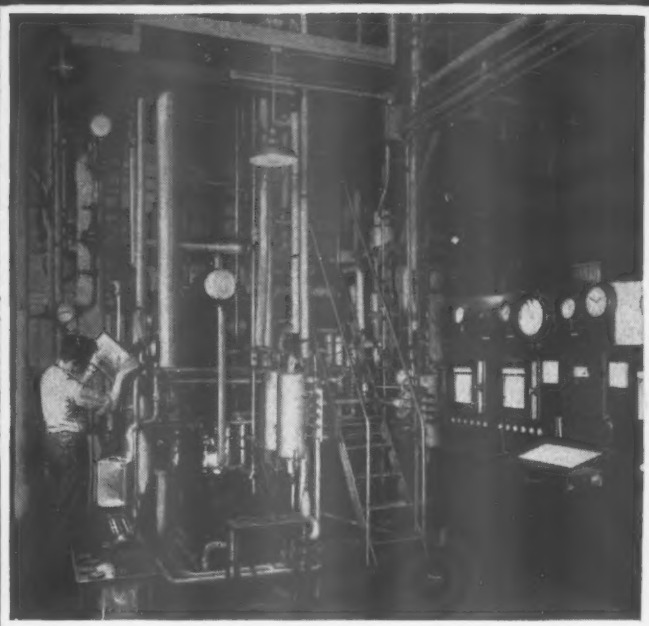


1 FIRST STEP ... the Kellogg yard ... arrival of samples of the refiner's present crude, plus samples of available crudes that he may run in the future. For the changing chemistry and economics of crude supply must be considered. In our unique pilot plant refinery, every foreseeable variable of feed, continuous operation, and end products will be explored.



2 TOPPING STARTS the duplication of actual refinery practice, by fractionating the sample crudes into gases, distillates, and reduced crudes. With this operation, the highly accurate recording of quantitative and qualitative analyses of the fractions begins ... the first of the voluminous data needed for final calculations is obtained.

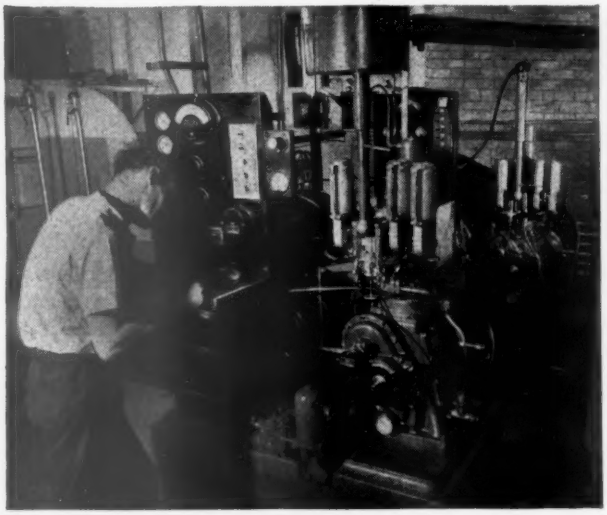
(CONTINUED ON FOLLOWING PAGES)



3 REDUCED CRUDE TREATMENT comes next. The effect of this propane decarbonizing operation upon the economics of cat-cracking is the subject of the investigation. Into the pilot go reduced crudes from the topping unit. Operations are varied to produce bottoms as low as 3½% on the crudes. Propane ratios, temperatures, throughputs, are also varied, and are tabulated to provide a graph of all runs.

4 TRUE YIELD DATA come from this cat-cracker of most advanced "Fluid" design. It is fed a mixture of decarbonized oils and gas oils from the topping unit. Catalysts, velocities, bed depths, are all varied to yield the desired gasoline quality standards, determine the most economical conversion rates, etc. For comparison, *reduced crudes* are also run directly, to obtain a contrasting pattern of yields, quality, and operational costs.

5 **QUALITATIVE ANALYSES** of feeds and products from all pilot runs are continuously performed in the Analytical Laboratory. Here, physical and chemical properties and other pertinent factors are assessed and carefully charted. When combined with utility statistics, operating conditions, and volume of yields from the pilots themselves, these data form a thoroughly sound basis for the final analysis by process engineers.



6 **MOTOR FUEL COMPONENTS** are engine tested. Operating as an adjunct to the Analytical Laboratory, test engines measure octane rating and lead susceptibility of gasolines. Gaseous components are analyzed in the Mass Spectrometer. Catalyst structure is continuously studied in X-Ray diffraction equipment. The comprehensive findings obtained from such modern analytical instruments form an important part of the complete report of the Analytical Laboratory.

7 **HERE THE FACTS ARE TABULATED.** And then, in the Process Design and Economics group, the complete data of the refiner's proposed and present refinery operations are weighed, with reference to specialized local costs – labor, utilities, transportation – and the specialized price structure for products in the proposed areas, both as of today and the foreseeable future. From this weighing of data comes a dependable, documented recommendation on which action can be safely taken.

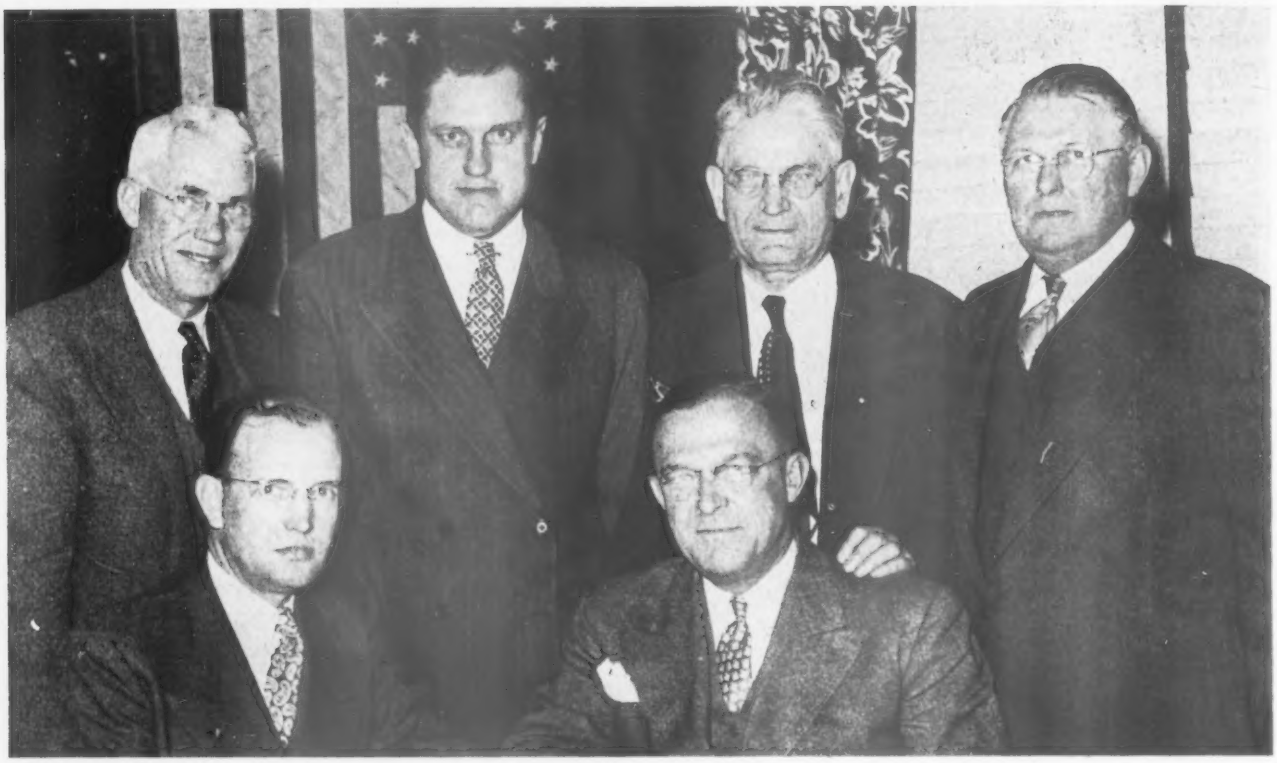
The technique outlined on these pages is regularly applied by Kellogg to answering the questions of its customers seeking to determine whether earning power of a proposed operation is favorable. Once this all-important factor is established, the data are at hand for designing the customer's individual plant . . . and for constructing it with every assurance that it will operate as predicted, from initial run throughout its planned future.

THE M. W. KELLOGG COMPANY

Engineers and Economists to the Petroleum Industry

New York, N. Y. • Jersey City, N. J. • Los Angeles, Calif. • Tulsa, Okla. • Houston, Texas • London EC2, Eng.

New Officers Elected by Michigan Petroleum Assn. at Convention



Newly elected officers of Michigan Petroleum Assn. (Seated right): president, Paul R. Kempf, Staebler-Kempf Oil Co., Ann Arbor; next to him is vice president, J. E. Truesdell, J. Austin Oil Co., Flint. Standing (l. to r.): secretary, William Olsen, Olsen Oil & Gas Co., Frankford; executive secretary Joseph Hadley; retiring president and newly appointed chairman of executive committee, Galen E. Wilson, Saginaw treasurer, Harold N. Merritt, Peerless Petroleum Co., Bay City

Michigan Jobbers Demand Labor Unions Be Made to Incorporate

Marketers Also Ask for Wider Jobber Margins and Relief From Bureaucratic Control

By Earl Lamm
NPN Staff Writer

DETROIT — About 200 jobbers attending the spring convention of Michigan Petroleum Assn. held at Detroit Leland Hotel, April 23-24, came up with a handful of resolutions concerning regulation of union labor, tetraethyl lead supply, gasoline and co-op taxation, a demand for wider jobber margins and relief from bureaucratic controls.

Resolution on union labor appeared timely, for while it was being written, James Hoffa, business agent for AFL Teamsters Union, was telling a meeting of local butcher shop proprietors at Amaranth Hall, April 23, that they must join the union or close shop. Plan he suggested was that the employers become associate members of the union, operating under $5 "permits" issued by the union. Details of the plan were to be worked out later. Sidney Black, manager of Detroit Retail Meat Merchants Assn., told NPN that one of the objects of the union was to force packers and wholesalers to employ more truck drivers by resuming deliveries on a prewar basis instead of forcing retailers to come for their supplies.

MPA resolution resolved that any labor union seeking to be recognized in oil marketing must be required by federal or state legislation to incorporate and register in the same manner and under the same rules as an ordinary private business corporation; that the union be made responsible under its contracts with employers and that contracts be made enforceable in court.

In making his annual report just prior to passage of the resolution, Joseph Hadley, executive secretary, said that some jobbers might feel that they were not large enough to warrant attention of the unions and setting up of locals to handle them.

"But what is likely to happen," he said, "is that locals will be set up for three or four companies operating in the same area."

"Very shortly," he cautioned, "you may be called upon by a representative from the Wage and Hour Division of the Department of Labor. You should have your skirts clean and be prepared to welcome them. They are likely to come up with some questions and answers that you never dreamed of before."

Some proposals have been made in Congress to liberalize the wage-hour law, Mr. Hadley said, and a resolution later adopted urged Congress to refrain from extending or liberalizing the law in any way. Specific thought, said the resolution, should be given to return of a substantial portion of government regulations to the states.

Urges Lead Subsidies if Necessary

Resolution on lead declared that the administration should become productive minded to the extent of subsidizing presently idle mines if necessary to secure an ample supply for tetraethyl leaded gasoline to keep reconversion transportation running. The jobbers also pointed out that because of constantly increasing cost of equipment and maintenance, and higher wages and taxes, jobber margins should be immediately increased .5c per gal. by OPA. In another resolution they "wholeheartedly endorsed" the FTC Detroit order.

In passing upon governmental agencies, including OPA itself, association reaffirmed its 1944 postwar policy of complete relaxation of controls, and asked for "protective" legislation during the surplus reconversion period so that jobbers may remain in business.

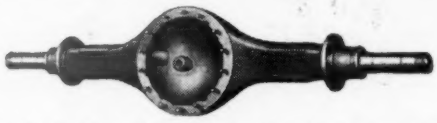
The federal tax on gasoline should be eliminated immediately, the association said, and the state tax of 3c per gallon should be retained at its present level.

Both sides of the co-op taxation ques-

MORE THAN YOU ASKED FOR!

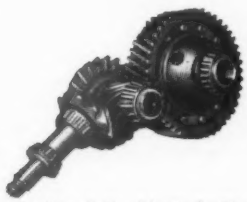
The new Timken S and U Series Axles* are the axles you asked for to whip your heavy-duty hauling problems—*and more too!* They're packed with every modern axle feature Timken's 40 years of experience can muster. They're big, tough and smooth-running. And they are in production now! Check the features below. Then do what good business sense tells you to do—specify Timken S or U Series under the next heavy-duty trucks you buy!

HOUSING

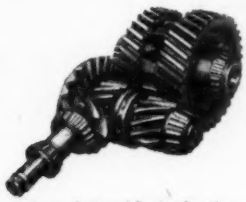


• New design for uniform distribution of load-carrying stresses with minimum weight • Ground alloy-steel sleeves inserted under great pressure • New exclusive "vertical-plane" inner oil seal maintains constant sealing pressure under all degrees of bearing adjustment.

FINAL DRIVES



Single-Speed Double-Reduction (S and U 200)



2-Speed Double-Reduction (S and U 300)

Single-Speed Double-Reduction (S and U 200)

•New hypoid-bevel gearing • Greater spiral angle of hypoid pinion permits more teeth in contact—reduces tooth loading • Teeth of helical gear and pinion are inclined across face, resulting in over-lap of tooth contact and lower individual tooth loading • All bearings (Timken tapered roller bearings) are adjustable • Shim adjustment for positioning of hypoid pinion with gear • Differential carrier legs supported in axle housing for greater rigidity • Hypoid pinion bearings mounted in removable cage • Single-speed final drive and 2-speed final drive are interchangeable.

2-Speed Double-Reduction (S and U 300)

• Combines for first time advantages of hypoid-bevel gearing with those of helical spur gearing. *Axle may be operated indefinitely in low range without damage* • New Timken Easy-Power Shift permits effortless change of axle ratios as required for speed, load or road conditions. Change from one ratio to another accomplished without loss of vehicle speed by selector and accelerator action only—no clutch action required • Built-in shifting mechanism—lubricated by gear lubricant. Vacuum or compressed air power chamber attached directly to gear carrier • Other features same as Single-Speed Double-Reduction final drives (see above).

SHAFTS DIFFERENTIALS

• New 9-16 tooth combination gives larger-diameter pinion—stronger teeth in gears and pinions • Pinions have longer hubs for increased bearing area on differential spider • Spiders have larger-diameter trunnions • New forged-steel differential case of symmetrical design.

• New high-carbon steel with new heat treatment • New shaft design eliminates failures at splines • Timken "Torsion-Flow" method of forging flange makes grain structure conform to shaft profile for equal distribution of stresses • Sixteen slant-side splines with increased root diameter permits maximum shaft body diameter.

BRAKES

P Series Power Brakes

DP Series Hydraulic Brakes

P Series Power Brakes

• Constant-lift cam and shaft forged integrally with 1½" diameter shaft. Needle roller bearings reduce cam friction to minimum • Equipped with Timken Econo-Liners—crescent-shaped, ¾" thick • Open-type brake spiders provide cooling inside drum and prevent air pockets. (Dust covers available for gravel conditions.) • Heat-treated, rust-proofed, pre-lubricated roller cam followers and pins of large diameter reduce friction and wear • New transfer bar hook-up—protected location for brake chambers • Interchangeable with DP Series Hydraulic Brakes.

DP Series Hydraulic Brakes

• The only *true* heavy-duty hydraulic brake made today because it has open-type construction, ¾"-thick crescent-shaped liners, and extra-heavy construction throughout • Simple two-shoe single-wheel cylinder design • Greater stopping ability at any given line pressure. Both shoes function as primary shoes in both forward and reverse directions • Equal braking ability in reverse • No change in parts required for either right- or left-hand installation • Shoe and lining assembly identical for all positions • Brake shoes removed for relining by simply removing one retainer spring. Wheel cylinder piston clamp not required.

GENERAL

• Advanced-related design provides great interchangeability of parts • Final drives interchangeable using same axle housing, shafts, etc. • Modern lubrication system • New increased ground clearance for off-the-road operation • Built by Timken—backed by over 40 years of axle and brake experience.

***FOR ALL HEAVY-DUTY HAULING**

S Series axles are for heavy-duty hauling on streets and highways where permissible loads are over 18,000 pounds at the tires on the ground. U Series for even greater load carrying capacity and off-the-highway operation. "200" designates SINGLE-SPEED Double-Reduction Final Drive "300" means 2-SPEED Double-Reduction Final Drive. Torque capacity of all axles designed for modern high-power engines. Data on aluminum housing, hubs and brake shoes for S-200 available upon request. (Above: Timken U-300 2-Speed Double Reduction Axle with front-mounted Easy Power Shift.)

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TIMKEN AXLES

THE TIMKEN-DETROIT AXLE CO., DETROIT 32, MICH.
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TIMKEN AXLE BRAKE DIVISION • DETROIT 32, MICH.

Head table at the opening session April 23: Left to right—E. J. Rengo, Rengo Service Stations, Kaleva, Mich.; C. J. Crooker, Gitche Gumee Oil Co., Ontonagon, Mich.; C. H. Kaiser, Star Oil Co., Port Huron, Mich.; James E. Truesdell, J. Austin Oil Co., Flint, Mich.; DeWitt Emery, President, National Small Businessmen's Assn., Chicago; James P. Welsh, "Old Traveler" of Automobile Club of Mich.; Galen E. Wilson, Retiring President, MPA; Howard Berolzheimer, NTEA; Paul R. Kempf, Staebler-Kempf Oil Co., new president, MPA; and L. R. Kamperman, Leonard Refineries, Alma, Mich.

tion were argued. Howard Berolzheimer, economist of National Tax Equality Assn., presented the story of private, tax-paying corporations on April 23. Some of his statements were challenged the next day before passage of the resolution to tax co-ops and government corporation on an equal basis. Paul Phillips, described as a "plain farmer" from Decatur, Mich., declared that the farmer co-op is "absolutely a free enterprise proposition". He argued for a system of single income taxation instead of double taxation on private business and individuals. However, he said, the disadvantage incident to obtaining tax exemption now offset the advantage with many co-ops and that 50% of them prefer to pay the tax.

Consumer co-ops, he felt, were different from the small farmer co-ops and the Internal Revenue Dept. should more clearly define a "reasonable" reserve deduction. A very liberal interpretation has been put upon it in the past, Mr. Phillips said.

Discussing the recent Patman House Small Business Committee report, he thought it cleared the co-ops of many charges of tax exemption.

Outlook for Small Business Dark

DeWitt Emery, president of National Small Businessmen's Assn., who spoke April 23 on "What's Ahead for Small Business," declared that if present trend continues—bankruptcy.

"One of the things wrong," he said, "is OPA. Whether or not it was necessary during the war, I'm not prepared to say, but it sure as hell isn't necessary today!"

Example of OPA injury to small business, he continued, was the experience of Thor Washing Machine Co., which made machines 100% for military during the war and had no reconversion problem after V-J Day, except obtaining a ceiling price from OPA. They manufactured a warehouse full of new machines, but still no decision from OPA. They finally shipped the machines to dealers who were begging for them, invoicing them on a tentative price basis until OPA made up its mind.

"OPA took the matter to court on a technical violation," Mr. Emery said, "and sued the company in Chicago for $150,000."

"We sent out more than 25,000 questionnaires recently," he continued, "and got over 6,000 replies from members in every category of business. Total of 96% of them stated they were not satisfied with OPA substantially as is; 75% of manufacturers who replied were holding some products off the market because of OPA and 98% of them said there was a ready demand for the articles being held off the market."

To illustrate the incredible demands of OPA, it was stated that General Electric asked if it was necessary for them to obtain an approved price on each of the 200,000 articles they manufacture. "OPA said yes," Mr. Emery declared, "and a single sheet price application on them will fill nine big volumes, plus all the argument and correspondence."

At the April 23 session J. L. Risinger, safety supervisor for Socony Vacuum, demonstrated the latest equipment for fire control and explained its use. At the April 24 morning meeting, L. R. Kamperman, vice president in charge of sales for Leonard Refineries, led a discussion on industry problems. He said that the present tendency was upward on both crude and product prices, with spring consumption whittling away the surplus gasoline stocks.

"The public is not interested in service stations as a business," he declared, "but it is interested in good service, which starts with good housekeeping."

Cites NPN Article by Bean

The Bean articles published in NPN, he said, had called the necessity for good housekeeping to attention of the industry, and a clean-up will be good public relations. "So far as our company is concerned," he said, "good public relations are essential."

Galen E. Wilson, retiring president, who acted as chairman of the meeting, said that a survey he had made among jobbers, convinced him gallonage in the state was good.

At the banquet Wednesday evening, Mr. Wilson was presented with a 21-

Kempf Heads Mich. Jobbers

DETROIT—Officers and directors elected by Michigan Petroleum Assn. at convention here April 23-24, were:

President, Paul R. Kempf, Staebler-Kempf Oil Co., Ann Arbor; vice president, J. E. Truesdell, J. Austin Oil Co., Flint; treasurer, Harold N. Merritt, Peerless Petroleum Co., Bay City; secretary, William Olsen, Olsen Oil & Gas Co., Frankford.

Five new directors named were: James Clark, Pontiac High Speed Oil Co., Pontiac; Frank Cutler, Cutler Oil Co., Lansing; Otto Eisengruber, Sebewaing Gas & Oil Co., Sebewaing; Carl McShay, Taylor Bros., Mt. Pleasant; John Perry, Perry Gas & Oil Co., Petoskey.

Retiring President Galen E. Wilson was elected chairman of the Executive Committee. Other members of the committee are: R. E. Decker, Detroit; E. E. Ledbetter, Dearborn; Mr. Truesdell, Flint; Harold Merritt, Bay City; L. R. Kamperman, Alma; William Olsen, Frankford; Peter Jensen, Escanaba, and Joseph Hadley, Detroit.

The Greatest Development in the History of Engine Protection

Again Purolator pioneers—this time with the *first* truly MICRONIC oil filter . . . an oil filter that actually traps *every* particle of dirt, dust, grime, hard carbon or other abrasive that can get in a car's oil . . . right down to the size of a micron (.000039 of an inch).

In addition, the Purolator MICRONIC Oil Filter is "warp proof". Water and other crankcase dilutions of oil have absolutely no effect on its performance. Even after the famous 300 Hour U. S. Navy Submersion Test in ocean water, the Purolator MICRONIC Oil Filter still gave 100% perfect filtration.

When you specify an oil filter . . . specify Purolator. Purolator Oil Filters have a proven record of outstanding performance on every type of diesel or gasoline engine . . . under every sort of operating condition. For unusual requirements, to meet a particular need, Purolator invites your inquiries. Purolator research men, working in conjunction with the engineers of other firms, have solved many a vexing oil filtration problem. Purolator Products, Inc., Newark 2, N. J. In Canada: Purolator Products (Canada) Ltd., Windsor, Ontario.

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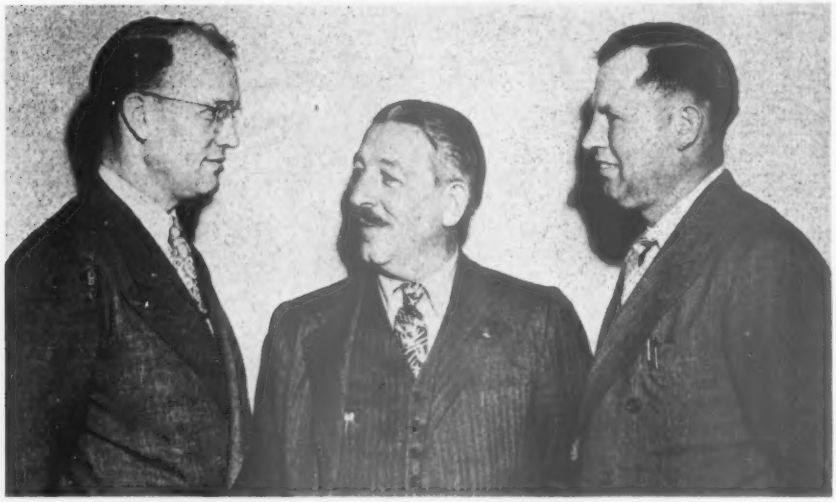

A. D. Dubuisson (center), Wolverine Service Stations, South Haven, Mich., tells J. E. Truesdell (left), Austin Oil Co., Flint, and John E. Solinski, Terminue Oil Co., Bay City, of his optimism concerning business for the first postwar summer tourist season

jewel gold watch in appreciation of his association work during the past year. The presentation was made by A. D. Dubuisson of Wolverine Service Stations, South Haven.

Next meeting of the association will be held at Park Place Hotel, Traverse City, Sept. 10-11.

Foresees Greater Use in Future of Sales Engineers

By NPN Staff Writer

DETROIT — Two hundred Michigan jobbers were told last week (April 24) that "we will have to approach the future upon a different basis than that upon which it (oil marketing) has been built," and the use of sales engineers to improve oil marketing will be greatly increased. Roy F. McConnell, vice president in charge of sales, Standard Oil Co. (Indiana), speaking at the spring convention of Michigan Petroleum Assn., went on to say, "I hope to live to see the day when sales people in petroleum and all other industry will take their rightful positions."

He explained that in the past production, pipeline and refining branches of the industry have been contending they made the money while the marketing department lost it. That is going to be changed, he declared. Following a survey of service station property in the Detroit area, he said, Indiana Standard had formulated plans for discarding $225,000 worth of property.

"We put the amount at $225,000," he said, "because it sounds less than a quarter of a million, but it's still a lot of money to explain to stockholders."

The average piece of service station property in Detroit, he continued, is going to cost about $15,000, and the new service station, plans for which have been drawn up, is estimated to cost $12,000 to $14,000, but the cheapest contractor's construction price obtained to date is $32,000.

It was pointed out that before the war, service station attendants were paid about $60 a month for working long hours daily. Mr. McConnell questioned the ability of that type of employe to successfully manage stations costing as much as $47,000. Present value of all Standard of Indiana station properties was given as $75,000,000, and Mr. McConnell said they were now in process of building an organization to handle them. He referred to the program for use of 100 company-operated service stations for training employes. He said the first one in Detroit would open about May 15.

"That's the sole purpose of our coming in here (with company operated stations)," Mr. McConnell declared. "We're not going to disturb the market. We merely want to improve oil marketing, and invite you to join with us—and I hope you can beat us in answering some of the questions."

Invitation was extended the jobbers to visit and inspect the new training station after it was put into operation.

Touching upon FTC's decision in the Detroit case, Mr. McConnell read a statement prepared by company attorneys explaining that he was unable to comment upon the merits or demerits of the order because the proceeding is still pending before the commission on various motions filed by the company, by attorneys for the commission and by representatives of jobbers and dealers.

However, he said, a great deal of attention had been directed toward Standard Oil Co. since the order was issued though only 5% of their business is involved in the order. "But I'm not taking sides either way," he said. He pointed out that whether good or bad, the policies of Standard have enabled "every man in this room to make a pretty good profit and grow. So maybe our policies haven't been so bad," he added.

Switching to the supplying of 200 to 300 gal. tanks for farm storage, which has been another touchy subject among oil jobbers, Mr. McConnell declared: "You forced us to go into it. But we are leasing them and are not giving them away. We get 5% return on our money . . . . . you ask me about the future? It's up to you."

Standard has always taken high side of market prices, he said, and have no choice but to remain there. "We have an expensive sales force," he explained. "You know our problems and we know yours. We are going to teach our salesmen to know their merchandise. We know what the public wants—its desires and whims—and we are going to meet them at a profit."

He then inquired as to the definition of an independent oil company and said that if it were permissible for "one of the bigger independents" to join the Michigan Petroleum Assn., he would approve applications for three representatives of Indiana Standard. He suggested that members get acquainted with Standard's men.

He recalled that though he has been in the oil business for 40 years, an invitation to speak at the Indiana convention March 14-15 was his first. He urged the jobbers to "develop that opportunity (independence) wherein men grow. You can make your own decisions."

Among Indiana Standard men present at the sessions were branch office managers P. A. Raupagh, Detroit; L. J. Thompson, Grand Rapids and E. G. Rounds, Saginaw. Mr. McConnell was accompanied from Detroit by R. Flake Baity, assistant general manager of sales since A. W. Peake, Standard president, had to be in New York.

Resolutions Adopted By Michigan Jobbers

DETROIT — Resolutions adopted last week by Michigan Petroleum Assn. and the organization's declaration of postwar policy call for:

1—Any labor union seeking to be recognized must, by either federal or state legislation, be required to register and to incorporate in the same manner and under the same rules as an ordinary private business corporation, and that such labor unions be responsible under their contracts with employers and enforceable in a court of competent jurisdiction.

2—Congress to refrain from extending or liberalizing in any way the present Fair Labor Standards Act and that Congress be further urged to give spe-

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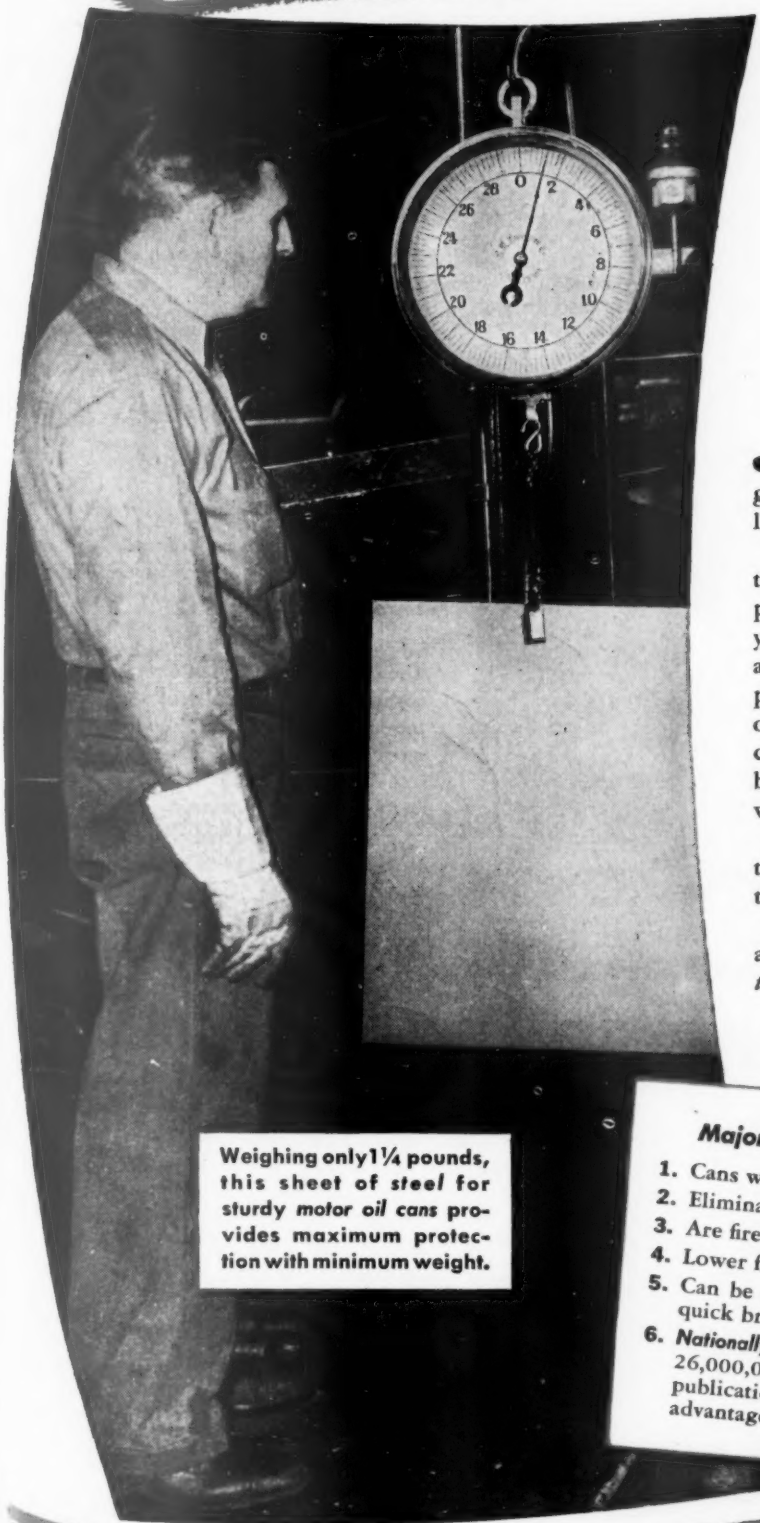

Weighing only 1¼ pounds, this sheet of *steel* for sturdy *motor oil cans* provides maximum protection with minimum weight.

● Protection without poundage! That's what you get when you pack your *motor oils* in durable, but lightweight, *steel cans.*

Pressure-rolled to fractional *thinness* and heat-tempered for greater *strength,* the lightweight steel plate for sturdy cans keeps freight costs low for your motor oils. *Shatterproof, fire-resistant* steel cans also eliminate the need for compartmented shipping cartons or special handling to protect motor oils on their way to retail markets. And *compact* cans require less space on trucks and trains . . . can be racked conveniently on service station islands without danger of profit loss due to package damage.

Motorists, too, prefer the *tamperproof* steel can that eliminates danger of substitution . . . assures them full measure of clean, unadulterated motor oil.

Yes, for lower production and shipping costs and all-round product protection, you can count on *trouble-free* steel cans.

Can Manufacturers Institute, Inc., New York

Major Reasons for Packing Motor Oils in Cans

1. Cans won't break, split, crush or tear.
2. Eliminate danger of substitution.
3. Are fire-resistant.
4. Lower filling, shipping and handling costs.
5. Can be colorfully lithographed for effective display and quick brand identification.
6. ***Nationally Advertised*** — This month alone more than 26,000,000 full-page, full-color ads in leading national publications are bringing home to shoppers the many advantages of buying merchandise packed in cans.

NO OTHER CONTAINER PROTECTS LIKE THE CAN

cific thought and consideration to return a substantial portion of governmental regulations to states.

3—The administration to become productive minded to the extent that whatever means are necessary to produce more metallic lead be exhausted, even to the extent of subsidization of now idle lead mines rather than curtail the use of lead in essential mobile transportation during this reconversion period.

4—Federal government to retire from the field of gasoline taxation at the earliest possible date.

5—Retention of present 3c per gallon Michigan gasoline tax and that any attempt to increase such rate be thoroughly discouraged.

6—An immediate increase in jobber margins to a minimum of 0.5c increase per gallon to be authorized by OPA and OES.

7—All government corporations and co-operative forms of business now in competition with private business or hereafter formed, to be subject to all rules and regulations of private business and be taxed in the same manner and pay the same taxes as private business.

7—Wholehearted endorsement of FTC's order in the Standard of Indiana case.

8—(a) A complete relaxation of bureaucratic government control.

In its declaration of postwar policy, association declares the petroleum industry, because of the national wartime emergency, has been subjected to a vise-like grip at the hands of government. This control, for the most part, has been arbitrarily exercised to the extent that the independent petroleum marketer has suffered irreparable injury. With cessation of hostilities, the need for further bureaucratic governmental control is eliminated, the continuance of administering agencies must be terminated, and the legislative function of government be restored to our representatives in Congress.

(b) Protection for the independent marketer and distributor against the hazards of surplus production and chaotic marketing conditions.

The petroleum industry is geared to an all-time peak production due to the needs of the armed forces. As these requirements are lessened and the era of postwar activity is inaugurated, the marketing branch of the industry will face a period of over-production and limited markets.

Such hazards must be overcome through self-control within the industry, or by legislative action, but not by any type of governmental agency supervision. By legislative action, we mean such a federal law as gives the small business man the right to recourse to his own local federal court and a jury of his neighbors. This provides for government protection as opposed to government control.

As Eastern Petroleum Credit Group Members Met in Boston

Shown here at the Petroleum Credit session in Boston are William V. Brown, manager of mail and express, Northeast Airways, Inc., Boston; Mr. Mathewson, Boston; J. C. Richdale, vice president, Colonial Beacon Oil Co., Boston

Snapped by the NPN photographer during the 9th annual conference of Eastern Petroleum Credit Group (April 15-16) in Boston (see NPN April 24, p. 20) were these men: R. B. Thrush, Sun Oil Co., Philadelphia; D. C. Burroughs, Shell Oil Co., Inc., New York; C. M. Mathewson, Cities Service Oil Co., Boston; J. C. Stacks, Atlantic Refining, Pittsburgh; E. W. Taylor, Shell Oil Co., Inc., Boston; Walter L. Driscoll, First National Bank, Boston; R. R. Jarvis, Socony-Vacuum, Boston; C. E. Vath, Royal Petroleum, New York

SHORT TAKE-OFFS . . . SMOOTH LANDINGS

Executives and sportsmen who fly will welcome the noteworthy engineering advancements now incorporated in the famous *Grumman Widgeon Amphibian.*

The new *Widgeon,* for example, possesses a deeper Bow Section providing for better water handling and increased stability. Its newly-designed hull bottom, too, is equipped with Step Vents, latest U. S. Navy innovation for flying boats, that aerate the afterbody and buoy the ship on an air cushion for short take-offs, smooth landings. The net result is materially to extend the *Widgeon's* water performance and range of service. Its enhanced ability to alight upon and depart from even the smaller lakes and more limited water areas is truly outstanding.

Available for immediate delivery.
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'Perfect' Service Station's Score Of 86% Illustrates the Need for . . .

NPN's Inspection Form

No one can carry in his head all the points that contribute to the kind of service station housekeeping that GETS AND HOLDS CUSTOMERS. If every matter of importance to the motorist is to be checked, an inspection form is necessary.

There could be no better example of this fact than that turned up in the following article. It tells how a "perfect" service station scored 86% on NPN's Housekeeping Inspection Form, which was published in last week's National Petroleum News.

The station failed to attain 100% not because the form calls for an unattainable ideal, but because even an excellent operator can miss some minimum standard points if he is making his checks without an inspection form. The story tells, too, how easily and inexpensively this station's deficiencies were corrected.

By Herbert Taylor
NPN Staff Writer

Inspecting a service station to quickly determine housekeeping conditions without the proper tools is like filling a 'gas' tank with a bucket. It can be done, but it is an expensive operation with dubious results.

The required tools are a service station housekeeping form and a pencil. In from 15 to 30 minutes a station can be completely inspected and its deficiencies discovered so that corrections can be made promptly and efficiently. No slide rule, knowledge of mathematics, or even too intimate a knowledge of station operations is required. The more stations that are inspected, the easier and faster it is for the person making the inspection to complete the job.

But most important, the form tells what needs to be done to make customers like the station and want to come back. In the case of the station about which this article is written, the corrections could be made with very little expense.

A few weeks ago, in order to give NPN's completed service station housekeeping form a final trial, after the form's various sections had been used on many types of stations, a station considered one of the best in its territory was inspected.

This station was selected because it had just gone through a process of renovation in a major company's clean-up campaign, and was to be the model for other stations to follow. It had passed muster by an outstanding, housekeeping-minded operator. It had just been checked by a supervisor. And the company's division manager had labeled it "perfect".

Recheck Results in 86% Score

Yet a recheck by this writer and a double check by the company supervisor resulted in a score of 86%. The checks brought to light some deficiencies, most of which were corrected on the spot. To correct them cost practically nothing. The supervisor, who knew of the coming check, wanted to lay a bet that the score would be in the high nineties. He's no amateur, coming up from station helper to operator, and finally on his company's payroll due not only to his knowledge of station operation but because he was fundamentally a good housekeeper. After making his individual check and comparing it with that of the NPN staff writer, he admitted that it took more than know-how to inspect a station—and said he would buy some of the forms himself if the company didn't furnish them.

'Blow-by-Blow' Account

Here is "blow-by-blow" account of the inspection. For convenience, get your copy of the April 24 issue of NPN which reproduced the form and follow it through. Few stations, unless they have recently been completely and thoroughly cleaned up would produce as good a score, which more than ever stresses the necessity of frequent checks of all stations.

The first section—signs and lighting—most of the answers of which can be obtained by parking near the station, produced a score of 100%. The most difficult part of this section, which is not hard at all after the first inspection, is question No. 8. That question, "Do bulb sizes in use check with list of required sizes", in most cases brings up a "No" answer the first time. This is due to many stations not yet having replaced wartime substitute bulk sizes, or are hangovers of inexperienced operators not familiar with the fact that good and proper lighting is one of the first requisites of competitive, successful operations.

In the case of this station, the checkers knew that proper lighting arrangements had already been made and that the right size bulbs had been installed. So all that was necessary to check that part of the form was to ask an attendant to switch on the lights. That took only a few seconds.

The next section of the form—driveways and lawns—also came up with a perfect score and could have been inspected without leaving the car. In this station, only five of the 11 questions applied, since it had no shrubbery, flagpole, flag, or other points included in the form.

The section following on the condition of the exterior of the station demonstrated the need for a *complete* check for perfect housekeeping operations. It came up with a score of 88%. In previous checks, the operator, the supervisor and the division manager failed to note that the glass in the overhead doors of the lubritorium was not clean. By having the form as a reminder, the operator was asked to lower the doors and this oversight was corrected on the spot. However, an otherwise perfect looking station received a demerit from the public when the doors were down.

Pump Island Rates 100%

The pump island was entitled to a 100% score, as was the next section, "Building, Interior". This seldom happens and probably would not have been true here had the station not been on parade. The operator explained that this part of his station was his particular hobby and that only by frequent checks could he keep it in proper shape. Question 15, having to do with brooms, stepladders, etc., will many times be answered in the negative. Only way to correct the condition is for an outsider to make frequent checks. Operators and helpers "living" at the station quickly become accustomed to conditions that may irritate customers. And the good operators are glad to have these points called to their attention.

The necessity for restroom inspection

THERE'S A PROFITABLE DIFFERENCE

. . . *inside and out!*

Yes, there is a profitable difference when you put Neptune Red Seal Pumps to work in your service stations. *Inside* you get a Compact Unit with a dependable Red Seal Meter—a complete assembly of rugged metering and pumping equipment noted for long, trouble-free performance and easy maintenance. Every part is easily accessible, with ample work space for servicing. Equally important, Neptune safeguards your investment with an exclusive Single Unit Replacement Plan that gives you the opportunity to replace your work-worn Red Seal Compact Unit, register, motor, or hose reel at money-saving low prices.

Outside appearance is more than enamel deep on attractive Red Seal Pumps. And there are reasons. First, the sheet steel panels are carefully degreased and cleaned. Then they are "Bonderized"—dipped in a special solution that gives the steel a surface which permits the prime coat actually to "sink in" before baking. It becomes securely anchored to the metal. Then the finish enamel, likewise baked on, provides the attractive, porcelain-like exterior that is there to stay.

But you will want to know all about the profitable difference it makes to invest in Red Seal Pumps. So phone or write the nearest Neptune office or petroleum equipment jobber today.

Immersing sheet steel pump panels in Bonderizing solution to obtain a surface which securely *anchors* the prime coat to the metal.

Keep your Red Seal Pump looking clean and attractive

- With the prime coat Bonderized to the metal, and the best quality finish enamel baked on, the exterior of the Red Seal requires no more care to keep it looking clean and bright than the finish on a good automobile! If the HOUSING is washed every 3 months with soap and water, then waxed or Simonized, the high gloss surface will be preserved indefinitely.
- White pumps require some extra care, because even the best quality white enamel tends to "chalk" if not kept well waxed.
- Do *not* use chemical or gasoline for cleaning the housing.

NEPTUNE RED SEAL PUMPS

Accuracy you can bank on

NEPTUNE METER COMPANY
50 West 50th Street **New York 20, N. Y.**

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is indicated by the score of the station in question. The percentage was only 82. Yet the operator of this station is known as a "crank" on restrooms.

The points that brought the score down are items that are easily overlooked if an inspection form is not used, but things that are important to motorists.

In the restroom section of the form, there are 18 questions. At the station checked, 14 "Yes" answers were recorded; one did not apply to the station, but three had to be checked "No." These "No" checks were:

1. "Does the washbowl have a stopper, and is it attached?"

2. At this station it was perhaps not the operator's fault, but the question pertaining to the supply of soap, towels, napkins and toilet paper was out of necessity answered "No", since the supply of this material was low at the time of the check.

3. The last question in this section, "Is entire restroom up to standard of checker's bathroom at home?" is one that should be answered "Yes" only if all the other questions in this section have been answered likewise.

In the case of the restroom inspection, the operator was glad to know the deficiencies. He sent a helper around the corner for a bowl stopper, called his paper and towel supplier. Result was that in a matter of a few minutes a couple of unfavorable conditions were corrected, which would have automatically straightened out the last "No" question.

Lubritorium Scores a Low 63%

The lubritorium section produced a low score—63%. Out of 20 questions, 10 were answered "Yes"; 6 "No"; 4 did not apply. The points developed from the "No" checks again demonstrate the necessity for inspections by others than operators. Many of these men are so close to their work that they cannot "see the trees for the forest". The 6 unfavorable answers found as the result of inspection of that section of the station were:

1. Are walls, ceilings, doors and windows clean?

The "No" answer was due to the fact that in washing cars mud had splashed on the walls and windows, and on the ceiling. It took the operator a couple of twists of the wrist to adjust the hose nozzle. He was glad to have the suggestion, since it saved future work in cleaning up the station.

2. Are grease containers neatly arranged and clean?

The containers were clean. But they were not arranged in an orderly manner. It took only a matter of minutes to line them up in "military formation", and went far toward correcting a rather untidy appearance of the entire lubritorium.

3. Are grades and brands plainly shown on each container?

The grades were indicated. But the markings were "homemade". The supervisor made a note of supply decals, which will correct this condition, and add much to the general appearance of the arrangement. In this station new equipment was on order, but in the meantime the few pennies each that the decals cost will pay dividends in a better looking lubritorium.

4. Are lubrication, alcohol and other charts clean and properly displayed?

It took only a glance to determine that they were not. The ones on hand had received a lot of wear from constant use and the operators had become accustomed to them.

5. Is tire rack clean and free of junk?

It happened that the answer to this question at the time of inspection was "No". But the condition was in the process of being corrected. Shortages of tires resulted in many racks becoming catch-alls during the war. Not being in use they accumulated a variety of junk.

6. Does inventory of lubrication tools check with required minimum?

At this station new equipment was being added as fast as it could be secured. The station is one where business has increased materially in the past few months, and perhaps the answer would have been "Yes" under old operations.

The section devoted to the heating system also cut down the general average of this station. Some very important points had been overlooked by the efficient operator of the station. They were corrected on the spot.

The heating system of the inspection form is a very short one, with only six questions to be answered "Yes" or "No". At the station under inspection two were answered "Yes"; one "No", and three did not apply, giving a score of 67.

The section devoted to personnel, produced a score of 83%. This was due to one of the helpers not being in complete uniform.

Summary of Station's Score

Here is the final score on the station, which was arrived at instantly by referring to the handy scoring table at the back of the form:

	"Yes"	"No"	Total Answers
Signs and Lighting	7	0	7
Driveways and Lawns	4	0	4
Building Exterior	7	1	8
Pump Island	11	0	11
building Interior	16	0	16
Restrooms	14	3	17
Lubritorium	10	6	16
Heating System	2	1	3
Personnel	5	1	6
Totals	76	12	88

This gives a percentage of 86% for an apparent "perfect" station. With little effort and expenditure of practically no money, it was possible to bring it up to 100% in a few minutes. Even stations presently in "poor" condition can be inspected and brought up to high standards quickly and inexpensively. But it takes the tools: the proper inspection form, and a pencil. That's all.

Sinclair Opens Tourist Service Bureau to Aid Motorists

New Auto Tour Service Bureau has been opened by Sinclair Refining Co. in Chicago, with P. O. Voss in charge. Travel aid to all motorists desiring it includes free road maps and consulting service in arranging the best routes and in giving out information on road conditions and points of interest. Similar service is also available at Sinclair district offices located in New York, Fort Worth, Atlanta and Kansas City

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*Here is a partial list of the bulk liquids handled at General American.

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Lubricating Oils	Benzol	Fish Oil
Naphtha	Xylol	Cotton Seed Oil

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Many Oil Jobbers Venture into Non-Automotive Merchandising Field to Meet Dealer Demands

Merchandise is hard to get, but jobbers vigorously are pushing merchandise expansion, first because of the direct profit that may be involved, second because they wish to hold or attract dealers and managers of the type who want to sell more things to their customers and thus realize better income from operation of stations.

Because of the shortages of tires and batteries, much of the current thinking on merchandise expansion relates to non-automotive items. This article, based upon an NPN survey, gives hints as to what you may be able to get and how to get it.

By Frank C. Sturtevant
NPN Staff Writer

This is still a seller's market. For an oil jobber, interested in non-automotive merchandise for summer, it means that he probably can sell at a profit whatever merchandise he can buy.

Despite the shortage of goods, an NPN survey of a number of representative jobbers shows that many want to expand their non-automotive merchandising and expect to be able to do it as a result of aggressive buying.

Whether these ventures into non-automotive goods are right or wrong still will bring an argument at any gathering of jobbers. Those who balk at going outside the usual TBA lines point out that sale of non-automotive merchandise tends to dissipate the attentions of dealers and managers and may arouse the antipathy of competing merchants who are gasoline customers. There is, too, the question of whether such sales in normal times actually return a profit.

Fortunately many oil jobbers have a long background of merchandising experience dating back to the days when service stations first began to sell something besides fuel and lubrication to motorists. For many years jobbers have been the source of supply for much of the TBA merchandise sold by their stations, and are familiar with warehousing, pricing and distribution.

Today the acute shortage of everything, especially tires and batteries which were always the two big TBA profit leaders, has forced jobbers to go far outside customary channels to satisfy dealer demands for something to sell. Consumer merchandise of all kinds has been bought wherever it could be found, and the search has led to manufacturers in textile, woodworking, chemical and many other lines.

In fact locating merchandise sources today is almost exactly like selling merchandise used to be: diligent use of the mails and the telephone, coupled with as many personal calls as possible, makes the most contacts and usually results in getting the most merchandise to sell.

Perseverance Pays Dividends

One jobber reports a regular program of telephone inquiries to all possible sources. He doesn't pass up even those who have consistently failed to have any goods available for him. On more than one occasion this persistence has paid off, he said, when one of his routine telephone calls happened to arrive just at the time when an allotment of scarce merchandise was being made.

Unsuspected sources of salable merchandise are sometimes found right around home. Many manufacturers, in the process of reconverting, are introducing items not formerly identified with their line and are glad to make quick, convenient marketing arrangements. A thorough canvass of all factories in the same or nearby towns has frequently produced results.

But distance is no bar to aggressive buyers. Some jobbers make regular visits

Non-Automotive Items to Be Sold in Service Stations in 1946

Housewares
Door Chimes
Brooms
Brushes
Mops
Sponges
Kitchen Stools
Stepladders
Wastebaskets
Bathroom Hampers
Coffee makers
Glassware
Ovenware
Tableware
Cutlery
Crockery
Utensils
Bath Scales
Ironing Boards
Can Openers
Paint
Paint Brushes
Floor Wax
Furniture Polish
Rust Remover
Spot Remover
Polishing Cloths
Phonograph Records
Light Bulbs
Candles

Small Appliances
Clocks
Waffle Irons
Toasters
Irons
Percolaters
Roasters
Table Radios

Sporting & Picnic Goods
Baseballs
Footballs
Bats
Masks
Mitts
Fishing Rods
Fishing Tackle
Archery Sets
Horseshoe Sets
American Flags
Outboard Motors
Windbreakers
Sun Glasses
Tennis Rackets
Tennis Balls
Badminton Sets
Folding Seats
Picnic Stoves
Heat Tabs with Stoves
Picnic Hampers
Thermos Bottles
Thermos Jugs
Thermos Chests
Plastic Cups
Swings
See-saws

Toys
Scooters
Bicycles
Velocipedes
Wagons
Irish Mails
Games
Blackboards
Marbles
Bike Speedometers
Children's Furniture

Hardware & Miscellaneous
Moth Spray
Fly Spray
Garden Seeds
Lawn Seed
Fertilizer
Metal Polish
Screw Drivers
Wrenches
Pliers
Hammers
Small Tools
Tool Boxes
Caulking Compound
Turpentine
Caulking Gun
Gloves
Overalls
Work Jackets
Flash Lights
First Aid Kits
Shopping Bags
Glue
Crack Filler
Cement
Plastic Wood
Garden Hose
Extension Cord
Clotheslines
Rakes
Shovels
Spades
Sewing Kits
Soap
Friction Tape
DDT Bombs

Farm Needs
Brooders
Milk Cans
Pails
Lanterns
Well Pumps
Milk Coolers

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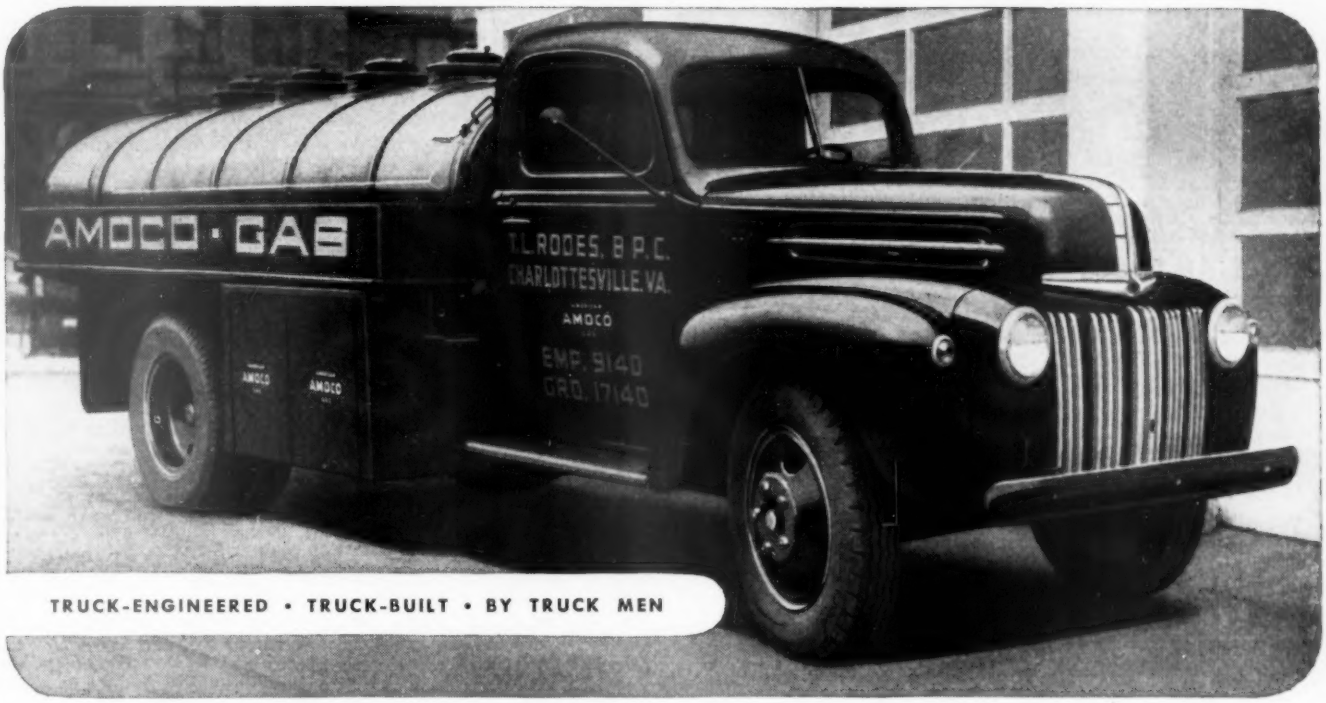

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"It carries a 1000-gallon, 5-compartment gasoline tank, with hose, reel and meter. I was delighted to find what an excellently balanced unit this makes for bulk delivery over either country roads or city streets. The driver is enthusiastic over the 2-speed axle feature, as it adds to ease of handling, increases gasoline mileage and saves unnecessary wear on the engine.

"From the service angle, too, Ford is 'way out in front," continued Mr. Rodes. *"We've been getting repair parts throughout the war. We know from experience that Ford Trucks have what it takes to provide safe, efficient, low-cost transportation."*

There isn't much more one could say in recommending a truck than Mr. Rodes has written. And letter after letter, from operators the country over, tells the same story. Ford Trucks stand up. They stay on the job. They are thrifty. They are easily kept in good condition.

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FORD CHASSIS ADVANTAGES: Easy accessibility for low-cost maintenance • Universal service facilities • Tough, forged front axles • Extra-sturdy rear axles with pinion straddle-mounted on 3 large roller bearings, ¾-floating type in light duty units, full-floating in all others • 3 axle ratios available (2 in 1-ton unit) • 2-speed axle available in heavy duty units at extra cost • Powerful hydraulic brakes, large drums, cast braking surfaces • Rugged 4-speed transmission with NEW internal reverse lock optional at extra cost on light duty units, standard on all others.

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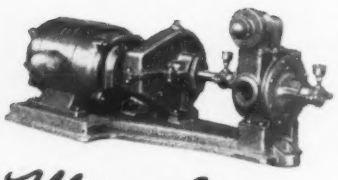

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Write for Bulletin No. 102—Pumps for the Petroleum Industry

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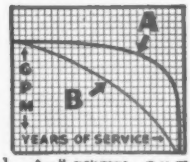
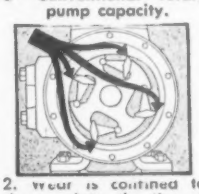
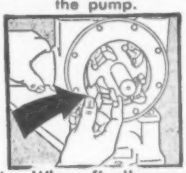


1. A—Blackmer pump capacity. Note the long sustained efficiency. B — Conventional rotary pump capacity.



2. Wear is confined to these points; the tips of the buckets, which automatically compensate for wear.

3. This much of a bucket can wear away without affecting the capacity of the pump.



4. When finally worn out, the buckets are easily replaced (a 20-minute job) and the pump restored to normal capacity.

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to buying centers just to look for merchandise, while trips of a thousand miles or more to close a deal for some scarce item are frequently necessary.

More than once a buyer has been able to make a spot purchase by offering to haul the goods away in his own conveyance, thus saving the shipper any further packing or handling. Such a deal has the additional advantage of preventing any possible reduction or cancellation of the order, and effects immediate delivery.

Pooling of purchases with other jobbers has also been resorted to with some success, where manufacturers could be induced to fill a larger volume order or offer a better price.

Many wholesaling plans are possible, including territorial franchises, both exclusive, non-exclusive and joint, for distributorships usually involving sales through other types of retail outlets, in addition to the jobber's own service stations.

A few private brand arrangements have also been made, in the hope of assuring a reliable flow of merchandise. But a point frequently mentioned is the importance of handling only good quality merchandise which can be sold without fear of customer complaints. No service station can afford to ruin customer good will for the sake of temporary merchandise profits.

Problem of What to Sell and Where

Also, in the scramble for goods, jobbers are not losing sight of one weighty problem they know they cannot dodge. That is the decision on what goods will sell at what stations. It has been found again and again that customers of one station will buy in good volume items that have no appeal to customers of another station.

Caulking guns go well at one station, while first aid kits are popular at another.

Many stations for some reason cannot sell crockery and glassware at all.

One dealer had to give up carrying fertilizer, because each transaction involved too much discussion of fertilizer merits, causing him to neglect his pump business.

These are of course the same kind of problems that have always faced retail storekeepers everywhere. They call for continuous study of customer preferences, and the use of some trial and error methods.

To date no scientific rules have been discovered for deciding what to stock, in service stations or any other kind of retail outlets. There is no substitute for close analysis of each station, the type of community in which it is located and the character of the motorists who patronize it. It calls for the best business judgment of the jobber and his dealers.

A table accompanying this article lists non-automotive items that the survey showed will be handled at some service stations this summer. For jobbers who are seeking to add to their line, the table will serve as a "tip" list.

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Among station operators, not 1 in 1,000 has to be sold on the advantages of having a clean, attractive station. Selling operators on that idea is not the problem.

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ONE THING IS SURE—Every operator (even the best of the natural born good housekeepers) needs some kind of a reminder . . . for two very sound reasons: First, there are more than 100 vital points at every station where customer confidence can be won or lost, and no operator can carry that many points in his mind: Second, it's just plain human nature to grow so accustomed to things around us that we accept them "as is".

Yes, every operator needs some kind of a reminder . . . but it has to be the right kind. Using just any kind of a reminder has been tried, over and over, and it won't work.

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The NPN INSPECTION FORM is based on the experience of many successful oil men; tested at every step in preparation, and as a finished unit, the NPN Inspection Form was developed to meet an industry-wide need . . . and it works.

Of course, buyers of a supply of NPN Inspection Forms will have their own plans for using them most effectively; but one thing seems rather fundamental; each station operator should have a copy of the form left with him at all times . . . as a reminder of things to be done, and as a guide in regular daily check-ups. Probably the station supervisor will also want to keep a copy of each "official" inspection showing the station rating . . . to hold the operator's interest in follow-ups, and as a record of progress.

The NPN Inspection Form is handy in size—4 x 9—slips into the pocket, and fits easily in one hand when making check mark entries; questions are grouped in sections and arranged in logical sequence; a simple rating system provides the essential incentive and competitive angle; finally, good quality of paper, durably bound in stiff covers, makes this a convenient, practical working tool.

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General Motors Recommends API Definitions On Crankcase Oils in Its 1946 Manuals

By V. B. Guthrie, Editor
NPN Technical Section

CLEVELAND — Heavy-duty motor oils, by the new API Lubrication Committee definitions, will be only inferentially recommended for passenger cars in the 1946 General Motors Car Owners Instruction Books and Manuals.

This was brought out by H. R. Wolf, Research Laboratories Division, General Motors Corp., in a paper, "Postwar Crankcase Oils", presented April 18 at the semi-annual meeting of the National Petroleum Assn. in Cleveland.

In the course of his paper Mr. Wolf presented the recommendations for motor oils for passenger car engines from the General Motors manuals, which are as follows:

"The regular or straight mineral motor oils are satisfactory for use in average passenger car service under normal driving conditions. These are considered to be a combination of low and medium speed driving with only an occasional long run at high speed.

"Under more severe driving conditions where the engine is required to develop more nearly full power for a much larger percentage of the time, as for example in mountain climbing and in sustained high speed driving, the premium motor oils are recommended.

"The heavy-duty oils, which are recommended for use in heavy-duty truck and bus Diesel and gasoline engines, are equally satisfactory for use in passenger car engines under the same operating conditions for which the premium motor oils are recommended."

The accompanying Table 1 gives the definitions for the three types of automotive crankcase oils which were adopted by the API Lubrication Committee in 1945.

The recommendations for truck engines in the 1946 General Motors car owners manuals are as follows, as given in Mr. Wolf's paper:

"In commercial service the crankcase oil frequently operates at a much higher temperature than in passenger car service and consequently is more subject to deterioration. Varnish on the pistons, valve stems and tappets cause sluggish operation of the engine. Sludge will eventually clog the oil pump screen, oil passages and oil control rings.

"The regular or straight mineral motor oils, which are generally used under normal driving conditions in passenger car engines, may be used in commercial vehicle engines under very light service conditions. The premium motor oils are recommended for use in normal or average service.

"The heavy-duty motor oils are recommended for use in heavy-duty commercial service where high crankcase oil temperatures are encountered. The heavy-duty motor oils contain detergent compounds and tend to hold in suspension the foreign solid contaminants which normally would deposit on the engine parts."

The following general information on the API Lubrication Committee motor oil definitions is to be given in the General Motors manuals, it was brought out in Mr. Wolf's paper:

"Types of Oils—Crankcase oils in service, unless protected against oxidation, may form sludge and varnish and under some conditions corrosive acids. To minimize the formation of these harmful decomposition products and to supply the type of oil best suited for the different operating conditions, the oil industry markets several types of crankcase oils. These types are defined by the General Committee, Division of Marketing of the American Petroleum Institute as shown in Table 1.

The General Motors recommendations

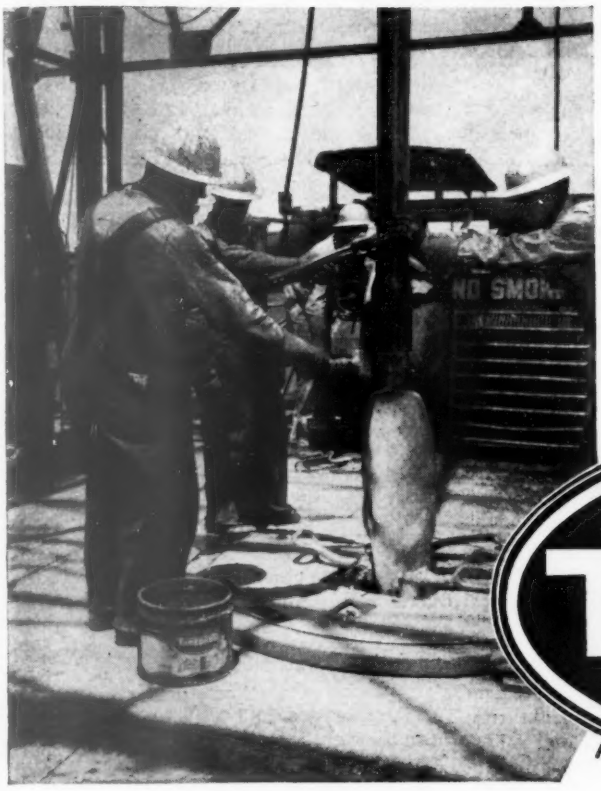
TABLE I

Definitions for crankcase oils adopted by the Lubrication Committee, Division of Marketing, American Petroleum Institute:

"**Regular Motor Oil**—This term shall be used to designate a straight mineral oil. Oils of this type are generally suitable for use in internal combustion engines under moderate operating conditions.

"**Premium Motor Oil** — This term shall be used to designate an oil having proved oxidation stability and bearing corrosion preventive properties. Oils of this type are generally suitable for use in internal combustion engines where operating conditions are such that regular oils do not give satisfactory service.

"**Heavy-Duty Motor Oil**—This term shall designate an oil having proved oxidation stability, bearing corrosion preventive properties, and detergent-dispersant characteristics. Oils of this type are generally suitable for use in both high speed Diesel and gasoline engines under heavy-duty service conditions."



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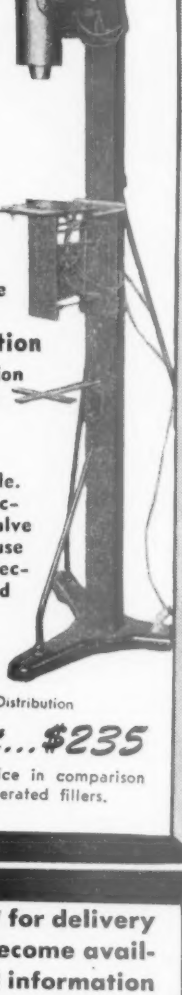

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conform to the general information on crankcase oils to be published in the next issue of the Handbook of the Society of Automotive Engineers, which was also given in Mr. Wolf's paper. On premium motor oils the SAE Handbook will state:

"As ordinarily used, the engine of a passenger car is seldom called upon to develop its full power. If, however, the same engine is used in a different type of service, as in mountain climbing, fast acceleration or sustained high speed driving, or is installed in a light truck, bus, tractor, motor boat or industrial equipment, it may have to operate at full power, or more nearly full power, for a much larger percentage of the time . . . . . Oils having improved stability and oxidation resistance may accordingly be required under these conditions. The API has classified oils of this type as premium motor oils."

The SAE Handbook will state on oils to meet heavy-duty service conditions: "In many heavy-duty operations, such as prevail in sustained high speed travel under heavy loads in some truck and bus service, the oil must possess detergent qualities in addition to improved oxidation resistance. Oils of this type, which have proved oxidation stability, bearing corrosion resisting properties and detergent-dispersant characteristics, are classified by the API as heavy-duty motor oils."

Comparison with Prewar Oils

In introducing his paper on "Postwar Crankcase Oils", Mr. Wolf stated the question is always asked, "Will the postwar oils differ from the prewar oils?" The outstanding postwar crankcase oils, as compared with the conventional prewar oils, will differ materially in composition and radically in performance characteristics, he stated. On the other hand, said Mr. Wolf, the postwar crankcase oils, as compared with the most advanced types of oils which were available prior to the war, will continue the trend that was interrupted by PAW Recommendation No. 40 (on additive compounds) and will incorporate many of the advances in compounding achieved during the war years.

"Prior to World War II", he stated, "it was thoroughly demonstrated that the conventionally refined straight mineral oils oxidize under the more severe service conditions and are unable to meet the lubrication requirements of the modern high-output gasoline and Diesel engines."

The cancellation of PAW Recommendation No. 40, stated Mr. Wolf, made available at the close of the war, for use in commercial lubricants, a large number of additive compounds which were of necessity restricted during the war years for use by the military and in essential transportation. However, the demand for stable lubricants for passenger car service and for heavy-duty gasoline and Diesel engines in heavy-duty bus and truck service has already resulted in the appearance on the market of a large number of improved crankcase lubricants.

The current list of Ordnance Approved heavy-duty oils issued Jan. 20, 1946, said Mr. Wolf, shows 195 SAE 10, 293 SAE 30 and 253 SAE 50 oils, a total of 741 oils marketed under 249 trade-brands by 129 oil companies.

In discussing the characteristics of motor oils to meet present day operating conditions, the following was brought out on the so-called regular oils, by the API definition:

"The highly refined, straight mineral, regular motor oils oxidize readily under high temperature operating conditions and form acidic products that may corrode bearing materials. Bearing failures are not confined to copper-lead or alloy crankshaft bearings. In many cases piston pin bushings are corroded; this type of failure is ordinarily incorrectly diagnosed as abrasion or wear. The conventionally refined, straight mineral, regular motor oils under similar high temperature conditions form sludge and oil insoluble oxidation products.". . . . .

"Under moderate or average driving conditions, these regular motor oils, as indicated by the SAE Lubricants Committee, will continue to be as satisfactory as in the past. However, it should be pointed out that the regular or straight mineral oils have not been entirely satisfactory in the past, even under average passenger car service. Unless the engine is operated at all times at temperatures low enough to insure that the oil will not oxidize, and further, unless the oil is drained at very frequent intervals, varnish and sludge deposits will accumulate and will eventually interfere with engine operation."

On the subject of premium oils, Mr. Wolf stated: "For many years the selling price was the only criterion for the customer's appraisal of a crankcase oil. Most petroleum marketers handled several grades of crankcase oils and the highest price product was generally referred to as a premium oil.

Term 'Premium' Assumes New Meaning

"With the advent of the improved products now commercially available and with the adoption of the new API nomenclature and definitions, the term 'premium' assumes a new meaning. It now refers to oxidation stability and bearing corrosion preventive properties and to outstanding performance characteristics.

"It has been previously pointed out that the premium motor oils are intended to possess the same degree of oxidation stability as is required to meet the recognized specifications for heavy-duty oils. In other words, the premium motor oils should meet the requirements of the CRC L-4 engine test. It is gratifying to note that a number of refiners are taking

this same attitude and are now marketing premium motor oils that are equivalent in oxidation stability to the heavy-duty gasoline and Diesel engine oils."

Regarding the heavy-duty oils by the API definition, Mr. Wolf stated: "Heavy-duty motor oils were originally developed for use in heavy-duty Diesel engines. However, their use was quickly extended to heavy-duty gasoline truck and bus engines and at the present time they are also being offered by some refiners for use in passenger car engines."

The requirements of U. S. Army Specification 2-104 B will remain the criterion for judging the oxidation stability and detergent characteristics of heavy-duty oils, Mr. Wolf said. "In the commercial postwar heavy-duty oils these properties should be maintained at the same high standards", he said.

One section of Mr. Wolf's paper discussed the effect of fuel on engine deposits. His conclusions were as follows:

"It has been conclusively demonstrated that the composition and properties of the fuel play a major part in determining engine cleanliness. At the moderate or intermediate temperatures, where little or no oil oxidation occurs, the fuel is the principal source of engine varnish and sludge deposits. At high engine operating temperatures, either or both the fuel and the oil may be responsible for engine deposits.

"Under these high temperature conditions, oil oxidation may be avoided through the use of stable premium or heavy-duty crankcase oils that are resistant to oxidation at the operating temperatures. Also under these higher temperature conditions, the varnish and sludge deposits resulting from the decomposition of the fuel may be somewhat reduced. However, many of the offending fuels, even at the maximum permissible engine operating temperatures produce excessive varnish and sludge and cause serious trouble in service.

"Passenger car and truck engines operate in service under over-lapping temperature conditions, and the only practical approach to the problem, at the present time, appears to be through the use of both stable crankcase lubricants and fuels free from varnish-forming components.

"The oil marketers must of course be familiar with these several factors in order to properly diagnose engine failures and correctly determine whether the varnish or sludge deposits in any particular case resulted from the decomposition of the oil, or fuel or both."

In concluding his paper Mr. Wolf called for continued co-operation of the automotive and petroleum industries in the use of the API nomenclature for recommending crankcase oils. "This will greatly simplify the problem of the individual car owner in obtaining the proper type of crankcase oil for use under the different types of service conditions."

Kinsolving Backs Away from Deal for Big Inch Pipelines

NPN News Bureau

WASHINGTON—WAA has been advised by W. C. Kinsolving, pipeline manager for Sun Oil, that he has reached "inescapable" conclusion that purchase and use of Big and Little Big Inch lines for any kind of peacetime petroleum service would be uneconomic.

He asked that WAA ignore earlier request that he and associates (meaning other companies in addition to Sun) be given opportunity to submit purchase proposal before reaching by WAA of any final decision on disposal of two lines.

Meanwhile opposition to use of Big Inch pipelines for transportation of natural gas, as proposed by two companies, is developing from coal, labor, and manufactured gas groups, a check of FPC records reveals.

Requests to intervene in any proceedings connected with applications of Trans-Continental Gas Pipe Line Co., Inc., and Big Inch Gas, Inc., to use government-owned pipelines if they can be purchased from War Assets Corp., have been filed by following parties:

Koppers Co., Inc., which sells manufactured gas in New Jersey; Public Service Commission of Missouri; Arkansas Public Service Commission; Order of Railway Conductors; Brotherhood of Locomotive Engineers; Brotherhood of Locomotive Firemen and Engineers; Switchmen's Union of North America; Eastern States Retail Solid Fuel Conference; Anthracite Institute; National Coal Assn. and United Mine Workers of America.

Southwest Emergency Pipeline Purchase-Rental Deal Is Set

NPN News Bureau

WASHINGTON — Completion of a combination purchase-rental deal for Southwest Emergency Pipeline with Southwestern Independent Gas Pipeline Co.—affiliate of the three companies forming Houston Industrial Gas System —was revealed this week by War Assets Administration.

Southwestern will pay $400,000 for 65-mile northern portion of line, running from San Benard River to Houston, on basis of $100,000 down and remainder over 15 years at 4% interest, plus $58,000 for unneeded facilities.

For half capacity of southern portion, running from San Benard River to Refugio, Southwestern will pay $25,000 annual rental, plus 0.5c per 1000 cubic feet for any additional gas it may transport, and 2c per 1000 cubic feet for gas carried through southern portion for distribution in contiguous territory.

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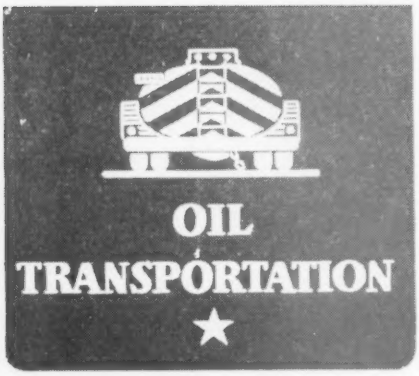

ICC Sets Hearing Dates on Petroleum Trucking Requests

NPN News Bureau

WASHINGTON—ICC has set following dates for hearing on applications of motor carriers to transport petroleum products, equipment and supplies:

May 13 at Jung Hotel in New Orleans —application of Federal Transportation Co., of Houston, for permission to transport in Texas, Louisiana, Mississippi, Alabama, Georgia and Florida supplies, equipment and materials used in development and production of petroleum and natural gas facilities.

May 13 at Robert E. Lee Hotel in Jackson, Miss.—application of R. W. Wood Trucking Co., of Natchez, Miss., for authority to transport machinery, materials and equipment used in development and production of petroleum and natural gas and for authority to haul petroleum products in Louisiana and Mississippi.

May 14 at Mark Twain Hotel in St. Louis—application of Commercial Transport Inc., of Belleville, Ill., for permission to transport petroleum and petroleum products in Illinois, Indiana and Kentucky.

May 14 at Hanford Hotel in Mason City, Ia.—application of Virgil W. Rapp, Northwood, Ia., contract carrier, to transport gasoline and petroleum products in Iowa and Minnesota.

Common Carrier Permit Is Recommended for Florida Firm

NPN News Bureau

WASHINGTON—Citing reconversion transportation of petroleum to Southeastern states from pipeline to tanker transmission, ICC Examiner Bruce Card has recommended to ICC that certificate as common carrier be issued to Petroleum Transportation Corp. of Jacksonville, Fla.

Transport firm formerly held temporary permit to deliver petroleum and petroleum products from Florida and Georgia terminals on Southeastern pipeline and petitioned ICC for extension of authority to operate as common carrier from Gulf and Atlantic Coast ports as well as from pipeline terminals.

Operators of Wartime Oil Trucking Group Unite To Form Southeastern Peacetime Transport Setup

Special to NPN

SPARTANBURG, S. C.—After four years of operation as War Emergency Co-Operation Assn., 65 of about 100 members of the association have joined to keep petroleum tank trucks rolling through the Southeast under the banner of Associated Petroleum Carriers.

Acting simultaneously, Joint Board 130 of ICC (comprising one member from each of the Carolinas, Georgia and Florida) extended WECA's authority to June 30, 1946, and gave APC permanent authority.

According to L. A. Odom, WECA general counsel and president and head of Odom Oil Co. here, the co-operation association was born of wartime necessity and was formally organized in May, 1942 by a group of petroleum transporters in the Carolinas, Georgia and Florida. Now with WECA nearing its ultimate end, the 65 stockholders in APC (58 are oil jobbers, dealers or agents) acted to continue the activities of transporting oil throughout the Southeast.

Majority of stockholders in APC are either oil jobbers or oil distributors in North and South Carolina and Georgia. Corporation's authorized capitalization is $50,000 but arrangements have been made to increase that figure to $250,000. It also has an option to lease or purchase 143 tractor-trailers from members of WECA.

Mr. Odom told NPN that WECA with headquarters here, operated at peak capacity 200 trucks and 300 to 400 drivers.

In its findings which granted APC's authority, the ICC board said that prior to the war the supply of petroleum consumed in the Southeast was transported principally by tank steamers to Savannah, Ga., Charleston, S. C., and Wilmington, N. C., with a large volume also moved by tank car to interior bulk plants. Due to wartime restrictions and dangers the Southeast was faced with a serious petroleum transportation problem and formation of WECA proved to be the solution.

Of APC the board said: "Utilizing the experience gained by its predecessor, WECA, applicant proposes to locate equipment at all points which are contiguous to but not at the pipeline terminals so that it can render prompt and efficient service to the public." The board also went on to point out that APC would insure service stations and bulk plants of more efficient delivery service, adding:

"The granting of the instant application is merely a substitution of applicant for WECA."

Trucker Gets OK to Continue 'War' Business

NPN News Bureau

WASHINGTON — Authority for a St. Paul trucking firm to continue part of petroleum transportation business built up during war years in Minnesota and Wisconsin has been granted by ICC despite objections of competing railroads.

Indianhead Truck Line, operated by Lester A. Wilsey of St. Paul, was awarded certificate as common carrier by motor vehicle of petroleum products from Minneapolis and St. Paul to points in Wisconsin within 125 miles of St. Paul.

In its order ICC said 10 shippers—including Cities Service, The Texas Co., Skelly, Pure Oil and Wood River Oil and Refining Co.—appeared at hearing in support of trucking firm's application. As to their testimony, ICC said:

"Through their experience, the supporting shippers here have found that, in many cases, tank-truck service has advantages over rail-tank service. In addition to its greater flexibility and speed, it permits faster and more economical unloading; it makes possible split deliveries of small quantities of different products; and it enables dealers to carry smaller stocks and maintain smaller storage facilities.

"By means of this service, distributors may also reach points not served by rail facilities and may by-pass bulk storage plants and make direct deliveries to retail stations and other outlets. The capacities of rail-tank cars range from 8,000 to 10,000 gals. Retail stations ordinarily have storage space for much less than 8,000 gals., while bulk plants can accommodate quantities much larger than 8,000 gals."

Although shippers were quoted as saying they did not plan to abandon use of rail service entirely, protesting railroads contended that need for motor transportation was only a "temporary one arising from war conditions" and, also, that permanent loss or diversion in peacetime of this traffic may affect their ability to continue operation of certain branch lines.

St. Paul firm previously had been transporting petroleum products under temporary authority.

In another case, ICC granted common carrier certificate to Thief River Falls Transport Co., of Minnesota to truck petroleum products from Superior, Wis., to certain points in Minnesota.

Price Controls on Contract Carriers to Be Dropped Soon

WASHINGTON—Rates of contract carriers by tank trucks will be removed from price control "within a month," OPA officials disclosed. Asserting that there no longer is any need for control of these rates, OPA explained that only legal technicalities now stand in way of removal.

Government Begins Sale of 591 Tankers to Industry; Unadjusted Sales Prices Listed

NPN News Bureau

WASHINGTON — Government last week went into business of selling to private industry world's greatest merchant marine fleet, including 591 tankers.

Regulations and statutory, or base, sales prices for disposal of war-built fleet under terms of Merchant Ships Sales Act were announced and Maritime Commission said it was ready to begin taking applications for disposal of the surplus vessels.

For tankers, commission fixed statutory sales prices of $2,026,500 for T-2 types and $1,903,125 for T-3 types. Statutory price will be adjusted in accordance with age of tanker and length of its war-service.

For each year of age of individual tanker, figuring from time of original delivery until date of sale, 5% will be deducted from statutory price for ordinary depreciation. In addition, deductions up to 4% will be allowed for each year of war service.

Maritime officials explained, for instance, that in case of 2-year-old tanker in which commission allows full 4% war-service deduction in addition to 5% depreciation deduction, the adjusted sales price would be $1,722,525. The figure was arrived at by deductions of 10% (5% for each of 2 years) for age of tanker and further deduction of 5% for year and a fraction of war-service) from statutory price of $2,026,500.

Other deductions on tanker sales prices, in addition to those for age and war-service, are authorized if the commission is of opinion that vessel is "not in class" or lacks certain "desirable features" incorporated in standard vessels of types under consideration. In case of vessel "not in class," cost of putting it in shape shall be deducted from adjusted sales price.

However, actual sales prices for tankers will not be permitted to drop below level of 50% of wartime construction costs of the ships. For tankers, the floor, or rock-bottom, prices are fixed at $1,505,352 for T-2 types and $1,485,015 for T-3 classes.

In determining base or statutory sales prices, commission first had to estimate what would have been cost of construction of tankers as of Jan. 1, 1941. As provided in disposal law, statutory price then was set at 87½% of estimated cost of 1941 construction.

Maritime officials, who estimated there will be 410 T-2 and T-3 tankers available for sale to industry, emphasized that each application would be handled as an individual case. It was further explained that applications by citizens will be given preference over bids of non-citizens and that purchase applications will get priority over charter bids.

In determining the order of preference between citizen applications, commission stated, it will consider, among other factors, extent to which losses and requisitions of applicant's prewar tonnage has been overcome and will give preference to former owners or to applicants for whom vessel was constructed but to whom delivery was prevented when government took over.

Commission further explained that to achieve uniformity and equal treatment in applications, all those received in a given calendar month will be treated together. First preference period will end June 1 and applications received by then will be given priority over those received in later calendar months.

Disposal rules also provided that no charter agreement would be made until 60 days from today,

If a bid is accepted for a tanker, or any surplus vessel, purchaser must pay down at least 25% of final adjusted sales price and retire balance of sales price in annual installments over "the 20-year life of the vessel," with 3½% per year interest on unpaid balance.

Officials in Tanker Division of commission explained that Liberty ships converted into tankers will be sold as Liberty ships, which will have sales prices ranging between $544,506 and $639,000. Statutory sales prices for T-1 type tankers will be announced later.

In regard to applications for purchasing tankers, commission ruled that bidders must, among other requirements:

1. File three "executed" and 15 "conformed" copies with Washington office of commission.
2. Certify as to ability of applicant to make required down payment and his ability and experience necessary to operate vessel under normal competitive conditions.
3. List brief description of shipping business of applicant and "any other business activities of applicant during the preceding eight years."

Additional provisions of disposal regulations are that purchasers of war-built vessels may exchange an old vessel for "an allowance credit" on new ships, and that all persons who purchased surplus vessels prior to enactment of Ships Disposal Law will be given opportunity to seek readjustment of price to conform with terms of present sales regulations.

Maritime Commission announced last week that leaflets describing surplus tankers for sale under terms of Ships Sales Law can be obtained by writing to commission offices in Washington. (See OILGRAM, April 23).

Lists of vessels available for sale also are being prepared and can be obtained from commission. Plans of various types of ships on sale can be inspected at commission offices here or at 45 Broadway, New York City.

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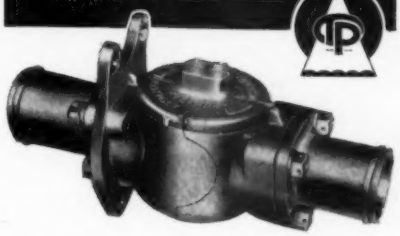

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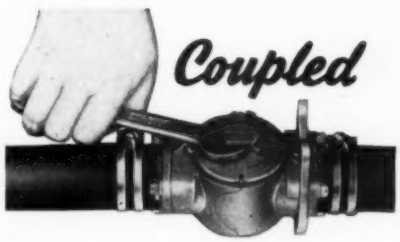

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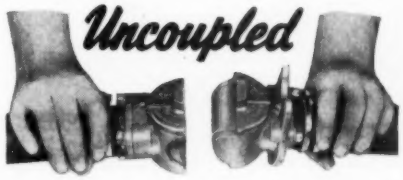

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Texas Refinery Stocks Show 8,888,545 Drop as of April 1

Special to NPN

AUSTIN, Tex.—Total petroleum refinery stocks were 8,888,545 bbls. less on April 1 than on the same date last year, Texas Railroad Commission has reported, although they increased slightly during March.

Stocks at refineries totaled 61,276,597 barrels on April 1, up 4875 bbls. during March. Crude in storage at refineries aggregated 14,840,086 bbls., compared with 15,223,792 on March 1.

Including pipelines and tank farms, petroleum stocks in Texas April 1 totaled 129,461,093 bbls. compared with 138,349,638 on April 1, 1945.

Deaths

R. Brink Tyler, 70, president of Central Oil Co., Glasgow, Ky., died in Louisville, Ky., April 20. He was also president of R. B. Tyler Co., road building firm.

° ° °

Grattan T. Stanford, general counsel, Sinclair Oil Corp., died April 28 in New York of a heart attack following an illness of more than a year. He was 64.

Mr. Stanford was born in Monticello, Ind., and was graduated from University of Notre Dame and Harvard Law School. Until 1916 he practiced law in Independence, Kan., and participated in formation of first Sinclair companies. In October, 1916, he came to New York as general counsel for the then Sinclair Oil & Refining Co. He is survived by his wife, a sister and a brother. Funeral services were held April 30 at The Church of St. Ignatius Loyola in New York City.

CRUDE PRICES

Since changes in crude oil prices are infrequent, the two pages of crude oil price tables are printed only when there are sufficient changes to warrant.

A record is kept in the Cleveland office of NPN and OILGRAM from which the publishers will be glad to make proofs, or letters or affidavits as to what the prices are, and without charge to regular subscribers.

Crude Price Changes

Valvoline Pipe Lines has corrected posting carried in NPN April 24, p. 60, under Valvoline Pipelines for Penna. Grade in Warren, Forest, Venango, Clarion and Butler Cos., Pa. Correct posting is $3.03.

For latest table of crude prices published, see NPN April 24, pages 60, 61 and 63.

Oil Markets

ATLANTIC COAST — Conflicting price trends for gasoline were noted in terminal markets along the Atlantic Seaboard in the week ended April 27. Prices for other products generally were reported unchanged, with kerosine and both light and heavy fuels holding firm at ceiling levels.

Increase of 0.2c per gal. in gasoline quotations at Albany, N. Y., and New England points was reported by one large supplier, effecting for the most part a similar increase in the highs of price ranges.

At the same time, a complete revision in his price schedule was announced by another large supplier which brought about reductions in the lows of price ranges of 0.05 to 0.25c at some mid-coastal and New England points. This supplier's new schedule was said to be based on the Gulf Coast cargo price, plus WSA freight, plus "other charges"; details of the "other charges" were not divulged.

Regular-grade gasolines at Norfolk ranged upward from 6.75c, off 0.05c. Portland low quotations also were down 0.05c at 7.05c, while Boston was down 0.2c at 6.9c, and Providence down 0.1c at 7c.

Toward the end of the week there were persistent reports of posted price shading in the Baltimore district. Spot sales of regular-grade gasoline, lacking confirmation, were said to have been made at slightly under 6c per gal. Postings reported by Baltimore suppliers, however, were unchanged at minimum of 6.375c for tank cars, 6.275c for barges.

Gasoline demand was reported heavy by some suppliers with others indicating only moderate seasonal increase in shipments. One large supplier said his April volume was running 60% over March.

Shipments of light fuels were holding up "surprisingly well", according to some suppliers.

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WESTERN PENNA.—Prices for all products were reported unchanged by western Penna. refiners in the week ended April 27.

Reports varied considerably concerning the status of gasoline. Some refiners said shipments were heavy from both the upper and lower fields, while others said demand was only fair. "Demand is far from being good for the season," one refiner commented.

Some refiners in the upper field were said to be on the buying side of the gasoline market. Reduced lead allocation necessitated their supplementing their own production with outside purchases to maintain shipments to regular accounts, it was said.

Reports on fuel oil also were contradictory with some refiners indicating continued overall demand while others said the call from domestic heating oil distributors had slackened appreciably. Some increase in demand was reported from the lower field as result of the coal strike.

Demand for lubricating oils, petrolatums and wax was described as "tremendous" by most refiners.

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GULF COAST—Gasoline prices at the Gulf were crowding ceilings again with leaded regular grades up 0.25c the past week and unleaded grades up 0.125 to 0.25c. Demand was heavy and prices rose on large volume sales, mainly to domestic buyers.

On April 23, a 135,000-bbl. cargo of 74.5 oct. gasoline brought 5.5c per gal., up 0.125c from closing price the third week of April. On the same date, a full cargo of the same grade sold at 5.625c per gal. Both sales were to domestic buyers for prompt lifting, coastwise.

On April 25, four full cargoes and two part-cargo lots of regular-grade gasolines sold at 5.625c, all for prompt lifting coastwise. Two small lots of Ethyl gasoline sold the same date, one lot at 6.375c; price of the other lot was not divulged.

At the end of the week, many suppliers were asking 5.75c (ceiling) for regular-grade gasoline although it was indicated in some quarters that 5.625c could still be done on firm offer.

At least two cargoes of Ethyl gasoline were being offered at 6.375c at the end of the week, but most suppliers were indicating 6.5c and up for this grade.

Held at prices 0.125 to 0.25c higher, the unleaded gasolines for the most part were at ceiling levels, with 70 oct. at 5.625c; 68 oct., 5.5c; 65 oct., 5.2 to 5.25c; and 60 oct., 5c.

Two large buyers were in the market for No. 2 fuel, indicating commencement of their storage programs for the next heating oil season. A mixed cargo of No. 2 fuel at 4.25c and 41-43 kerosine at 4.625c was reported sold to an eastern distributor for lifting April 25.

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MIDWESTERN — Low of refiners' range for Ethyl gasoline advanced 0.25c the past week, leaving one refiner quoting this grade at 6c, while quotations of other refiners ranged from 6.125c to 6.75c, Group 3. Low of regular-grade gasoline also was up 0.125c, leaving only one refiner quoting the low of 5.125c while other refiners asked 5.375c to 6c, Group 3. Refiner quoting the low of both ranges said he was meeting competition to regular customers at those prices.

Refiners, explaining the suddenness with which the gasoline market has turned upward, generally said that it was due to lead shortage and a demand that exceeded expectations for April. Some refiners reported demand had increased

as much as 40% over March and others said demand for April was 15% over what they had anticipated. Refiners stated that when they tried to meet these shortages by buying open spot they found they were unable to buy at 5.125c, Group 3, and that an open spot price of 5.25c was firm at the beginning of the week. At the end of the week, open spot offerings of regular gasoline were reported as high as 5.5c.

Marketers' quotations in the Midwest gave a confused picture as one marketer who had made no sales for several days continued to quote Ethyl at 5.625c, another 5.75 to 5.875c, when still other marketers were asking 6 to 6.25c. Same situation prevailed regarding regular gasoline with one marketer asking 4.875 to 5c, Group 3, while others asked 5.125c to 5.5c. Marketers who were active in the gasoline market reported refinery offerings of regular gasoline at 5.25 to 5.375c as "common", although one marketer said he was still buying regular at 5.125c. This marketer reported sales April 26 of 2 cars Ethyl at 5.875c, 4 cars regular at 5.25c, and 2 cars regular at 5.375c.

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CENTRAL MICHIGAN — Demand for all grades of gasoline was reported good throughout the past week by refiners in this area. Refiner previously quoting 5.25 to 5.5c for straight-run gasoline said that he was now asking flat 5.5c. No changes in quotations were reported by other refiners.

Latter part of the week some refiners reported heavy gasoline shipments to resort areas in northern Michigan due, they believed to opening of the trout season April 27. Traffic to those points was said to be heavy and reports were that hotels and resorts were booked to capacity for the first three days of the season. Vacation travel this year is expected to be heaviest in history.

° ° °

MIDCONTINENT—Stronger gasoline market was indicated in the midcontinent the past week when several Oklahoma refiners and one in Arkansas reported advances of 0.125 to 0.25c in their quotations. At the end of the week price ranges stood as follows: Oklahoma, 78-80 Oct, Ethyl, 6-6.75c; 73-75 Oct., 5.125-6; 60 Oct. & below, 4.75-5.25c; Arkansas, 78-80 Oct. Ethyl, 6.75c; 73-75 Oct., 5.75c; 60 Oct. & below, 5.125c.

Independents as well as major companies were in the market looking for gasoline with most attempts unsuccessful, reports indicated. Reasons given for market tightening were lead shortage and greater than anticipated consumption during April.

Although seasonal drop in demand for kerosine and heating oils was apparent, the only easing in price was in East Texas where one refiner said he was offering 42-44 kerosine in tank cars at 4.75c, FOB Group 3. For truck transport lots, East Texas refiners continued to quote 4.875c to 5c.

Withdrawal of quotations for some grades of neutral oil and bright stock was reported by two midcontinent refiners but price ranges were unchanged. One refiner said he was sold up for the balance of the year, while the other said he was using his entire production in trade-marked oils. Demand was described as "terrific" by a third refiner who said he was selling now for third quarter delivery and still having to turn down some orders.

Sales reported during the week included the following: Two cars Ethyl at 6.25c, three cars regular-grade at 5.5c, and one car third-grade at 4.875c to jobbers in Midwest for immediate shipment by an Oklahoma refiner.

Twenty-five cars Ethyl at 6.25c and five cars regular at 5.5c for prompt shipment to Midwest broker by another Oklahoma refiner.

Eight cars of grade 26-70 natural gasoline were reported sold open spot at 2.75c, FOB Group 3 during the week. No open spot sales were reported FOB Breckenridge; sellers quoted 2.25c.

Summary of Daily Gasoline Prices (April 22 to April 29)

U. S. Motor (ASTM octane)	Monday April 29	Friday April 26	Thursday April 25	Wednesday April 24	Tuesday April 23
78-80 octane Ethyl:					
Oklahoma	6-6.75	6-6.75	6-6.75	6-6.75	6-6.75
Mid-Western (Group 3 basis)	6-6.75	6-6.75	6-6.75	6-6.75	6-6.75
N. Tex. (For shpt. to Tex. & N. M. dest'ns.)	7	7	7	7	7
W. Tex. (For shpt. to Tex. & N. M. dest'ns.)	7	7	7	7	7
E. Tex. (Truck Tnsp.)	7	7	6.75-7	6.75-7	6.75-7
73-75 octane:					
Oklahoma	5.125-6	5.125-6	5.125-6	5.125-6	5.125-6
Mid-Western (Group 3 basis)	5.125-6	5.125-6	5.125-6	5.125-6	5.125-6
N. Tex. (For shpt. to Tex. & N. M. dest'ns.)	6	6	6	6	6
W. Tex. (For shpt. to Tex. & N. M. dest'ns.)	6	6	6	6	6
E. Tex. (Truck Tnsp.)	6	6	6	6	6
63-66 octane:					
Oklahoma	5.25(1)	5.25(1)	5.25(1)	5.25(1)	5.25(1)
Mid-Western (Group 3 basis)	5.125(1)	5.125(1)	5.125(1)	5.125(1)	5.125(1)
N. Tex. (For shpt. to Tex. & N. M. dest'ns.)	5.625(1)	5.625(1)	5.625(1)	5.625(1)	5.625(1)
W. Tex. (For shpt. to Tex. & N. M. dest'ns.)	5.625(2)	5.625(2)	5.625(2)	5.625(2)	5.625(2)
E. Tex. (Truck Tnsp.)	....	....	....	....	....
60 octane & below:					
Oklahoma	4.75-5.25	4.75-5.25	4.75-5.25	4.75-5.25	4.75-5.25
Mid-Western (Group 3 basis)	4.75-5.25	4.75-5.25	4.75-5.25	4.75-5.25	4.75-5.25
N. Tex. (For shpt. to Tex. & N. M. dest'ns.)	5.2-5.25	5.2-5.25	5.2-5.25	5.2-5.25	5.2-5.25
W. Tex. (For shpt. to Tex. & N. M. dest'ns.)	5.25	5.25	5.25	5.25	5.25
E. Tex. (Truck Tnsp.)	5.25	5.25	5.25	5.25	5.25
Motor Gasoline, 78-80 oct. (Ethyl)					
New York harbor	7.25-8.95	7.25-8.95	7.25-8.95	7.25-8.95	7.25-8.95
New York harbor, barges	7.15-7.9	7.15-7.9	7.15-7.9	7.15-7.9	7.15-7.9
Philadelphia	7.25-8.95	7.25-8.95	7.25-8.95	7.25-8.95	7.25-8.95
Philadelphia, barges	7.15-7.9	7.15-7.9	7.15-7.9	7.15-7.9	7.15-7.9
Baltimore	7.25-8.7	7.25-8.7	7.25-8.7	7.25-8.7	7.25-8.7
Baltimore, barges	7.275-7.75	7.275-7.75	7.275-7.75	7.275-7.75	7.275-7.75
Motor Gasoline, 74-77 oct.					
New York harbor	6.25-8	6.25-8	6.25-8	6.25-8	6.25-8
New York harbor, barges	6.15-7.6	6.15-7.6	6.15-7.6	6.15-7.6	6.15-7.6
Philadelphia	6.25-7.7	6.25-7.7	6.25-7.7	6.25-7.7	6.25-7.7
Philadelphia, barges	6.15-6.9	6.15-6.9	6.15-6.9	6.15-6.9	6.15-6.9
Baltimore	6.25-7.45	6.25-7.45	6.25-7.45	6.25-7.45	6.25-7.45
Baltimore, barges	6.275-6.85	6.275-6.85	6.275-6.85	6.275-6.85	6.275-6.85
Motor Gasoline:					
Western Penna. Bradford-Warren:					
74 Oct.	7-7.25(2)	7-7.25(2)	7-7.25(2)	7-7.25(2)	7-7.25(2)
Western Penna. Other Districts:					
74 Oct.	6.75-7.25	6.75-7.25	6.75-7.25	6.75-7.25	6.75-7.25

Note: Gasoline prices are as reported in each day's Platt's OILGRAM Daily Oil Price Service.

OIL PRICE SECTION ★ At Refineries and Terminals and by Tank Wagon

Prices herewith are reproduced from Platt's *OILGRAM* Daily Oil Price Service, associated with National Petroleum News, whose representatives in all *NPN-OILGRAM* offices devote their time exclusively to reporting oil industry prices everywhere.

Prices shown are actual sales prices, or quotations meaning sellers' general offers or posted prices; for current sales and shipment; for the business day or period stated; except Tank Wagon prices, prices are for bulk lots such as tank car and motor transport; barge or tanker cargo lot prices are identified; FOB refineries or terminals; in cents per gal. except where shown in bbls. of 42 gals.; ex all fees and taxes; for crude oil and its products lawfully produced and transported; reported as received by *OILGRAM* and National Petroleum News but not guaranteed; for subscribers' private use only and not for resale or distribution or publication. For further details of price conditions apply to any *NPN-OILGRAM* office or see back of any *OILGRAM* Price Service invoice.

For complete price service delivered daily from nearest *OILGRAM* publishing office, New York, Cleveland and Tulsa, address Platt's Price Service, Inc., 1213 W. 3rd St., Cleveland (13), Ohio. Annual subscription rate payable in advance $100 per year train mail and $112.50 per year air mail.

Refinery Prices

Gasoline —U. S. Motor (ASTM octane except where otherwise specified)

Prices in Effect	April 29	April 22
OKLAHOMA		
78-80 oct. Ethyl	6-6.75	5.75-6.75
73-75 oct.	5.125-6	5-6
63-66 oct.	5.25(1)	5.25
60 oct. & below	4.75-5.25	4.75-5.25
MID-WESTERN (Group 3 basis)		
78-80 oct. Ethyl	6-6.75	5.75-6.75
73-75 oct.	5.125-6	5-6
63-66 oct.	5.125(1)	5.125(1)
60 oct. & below	4.75 - 5.25	4.75 - 5.25
N. TEX. (For shpt. to Tex. & N. M. dest'ns.)		
78-80 oct. Ethyl	7	7
73-75 oct.	6	6
63-66 oct.	5.625(1)	5.625(1)
60 oct. & below	5.2 - 5.25	5.2 - 5.25
W. TEX. (For shpt. to Tex. & N. M. dest'ns.)		
78-80 oct. Ethyl	7	7
73-75 oct.	6	6
63-66 oct.	5.625(2)	5.625(2)
60 oct. & below	5.25	5.25
E. TEX. (Truck Tnspt.)		
78-80 oct.	7	7
73-75 oct'	6	6
60 oct. & below	5.25	5.25
CENT. W. TEX. (Prices to truck transports)		
78-80 oct.	7 (2)	7 (2)
73-75 oct.	6 (2)	6 (2)
60 oct. & below	5.25 (2)	5.25(2)
KANSAS (For Kansas destinations only)		
78-80 oct. Ethyl	6.625- 7.2	6.625- 7.2
63-66 oct.	5.625- 6.2	5.625- 6.2
63-66 oct.	5.6(1)	5.6(1)
60 oct. & below	5.125- 5.5	5.125- 5.5
ARK. (For shipment to Ark. & La.)		
78-80 oct. Ethyl	6.75(1)	6.625(1)
73-75 oct.	5.75(1)	5.625(1)
60 oct. & below unleaded	5.125(1)	5(1)
WESTERN PENNA.		
Bradford-Warren:		
74 oct.	7 -7.25(2)	7 -7.25 (2)
Other districts:		
74 oct.	6.75 - 7.25	6.75 - 7.25

Prices in Effect	April 29	April 22
CENTRAL MICHIGAN (FOB Central Mich. refinery group basis; for shpt. within Mich.; shpts. may originate at plants outside Central group.)		
U.S. Motor:		
78-80 oct.	8 -9.25	8 -9.25
73-75 oct.	7 -8.25	7 -8.25
Str. run gasoline, excluding Detroit shpt.	5 - 6	5 - 6
OHIO (S. O. Ohio quotations for statewide delivery and subject to exceptions for local price disturbances.)		
73-75 oct.	8(a)	8(a)
(a) This price was inadvertently omitted in NPN's of April 17 & 24.		
CALIFORNIA		
80-82 oct. (Ethyl)	8 - 8.5	8 - 8.5
74-75 oct.	7 - 7.5	7 - 7.5

Kerosine, Gas & Fuel Oils

OKLAHOMA		
41-43 grav. w.w.	4.875	4.875
42-44 grav. w.w.	5	5
Range Oil	4.5	4.5
No. 1 p.w.	4.375	4.375
No. 1 straw	4.25 (1)	4.25 (1)
No. 2 straw	4.125	4.125
No. 3 fuel	4	4
No. 6 fuel	$1.11-$1.18	$1.11-$1.18
14-16 fuel	$1.18(1)	$1.18(1)
MID-WESTERN (Group 3 basis)		
41-43 grav. w.w.	4.875	4.875
41-44 grav. w.w.	5	5
Range Oil	4.5	4.5
No. 1 p.w.	4.375	4.375
No. 2 straw	4.125	4.125
No. 3	4	4
No. 6	$1.11-$1.18	$1.11-$1.18
N. TEX. (For shpt. to Tex. & N. M. dest'ns.)		
41-43 grav. w.w.	4.875	4.875
42-44 grav. w.w.	5 (1)	5 (1)
No. 1 p.w.	4.375(1)	4.375(1)
58 D.I.	4.55(1)	4.55(1)
No. 6 fuel	$1.18(2)	$1.18(2)
W. TEX. (For shpt. to Tex. & N. M. dest'ns.)		
No. 2 straw	4.125(1)	4.125(1)
No. 6 fuel	$1.18(1)	$1.18(1)
E. TEX. (Truck trnspt.)		
41-43 grav. w.w.	4.875	4.875
Tractor fuel	4.875- 5	4.875- 5
Range oil		
No. 1 p.w.	4.375(1)	4.375(1)
45 Cet. Diesel	4.75 (1)	4.75 (1)
No. 2 straw	4 -4.125(2)	4 -4.125(2)
58 D.I. & above	4.5 -4.75(2)	4.5 -4.75(2)
No.6 fuel	$1.18	$1.18
U.G.I. gas oil	3.5 (1)	3.5 (1)
AMARILLO, TEX. (For shpt. to W. Okla. & Tex. differential territory.)		
42-44 grav. w.w.	5 (1)	5 (1)
KANSAS (For Kansas destinations only).		
42-44 grav. w.w.	5.2	5.2
No. 1 p.w.	4.6	4.6
No. 6 fuel	$1.23	$1.23
ARK. (For shipment to Ark. and La.)		
42-44 w.w. kero	5 (1)	5 (1)
No. 2	4.125(1)	4.125(1)
No. 3 fuel	4 (1)	4 (1)
Tractor fuel	5.625(1)	5.625(1)
Diesel fuel 52 & below	4.5 (1)	4.5 (1)
Diesel fuel 58 & above	4.75 (1)	4.75 (1)
WESTERN PENNA.		
Bradford-Warren:		
45 grav. w.w.	6.55	6.55
No. 2 "	6.25(1)	6.25(1)
No. 3 "	6.25(1)	6.25(1)
36-40 gravity	6.25(2)	6.25(2)
Other districts:		
45 grav. w.w.	6.925	6.925
47 grav. w.w.	7.05(2)	7.05(2)
No. 1 fuel	6.675-6.925	6.675-6.925
No. 2 "	6.25 - 6.375	6.25 - 6.375
No. 3 "	6.25 - 6.375	6.25 - 6.375
36-40 grav.	5.75 - 6.375	5.75 - 6.375

Prices in Effect	April 29	April 22
CENTRAL MICHIGAN (FOB Central Mich refinery group basis for shpt. within Mich.; shpts may originate at plants outside Central group.)		
44-46 kerosine	6.25(1)	6.25(1)
46-49 gravity w.w.	6.3 - 6.5	6.3 - 6.5
P.W. Distillate	6	6
No. 2 light straw	5.75 (1)	5.75 (1)
No. 3 gas oil, Straw	5.5	5.5
U.G.I. gas oil	5	5
Fuel Oils (*Vis. at* 100).		
300-500 Vis.	4.64	4.64
100-300 Vis.	5	5
OHIO (S. O. Ohio quotations for statewide delivery)		
Kerosine	7.5	7.5
CALIFORNIA		
40-43 grav. w.w.		
San Joaquin Valley:		
Heavy fuel	$1.25	$1.25
Light fuel	$1.35	$1.35
Diesel fuel	4.75	4.75
Stove dist.	5.75	5.75
Los Angeles:		
Heavy Fuel	$1.25	$1.25
Light fuel	$1.35	$1.35
Diesel fuel	4 - 4.75	4-4.75
Stove dist.	5.75	5.75
San Francisco:		
Heavy fuel	$1.30	$1.30
Light fuel	$1.40	$1.40
Diesel fuel	5.25	5.25
Stove dist.	6.25	6.25

NOTE: All above heavy fuels meet Pacific specification 400; light fuel, spec. 300; Diesel fuels, spec. 200; and stove distillate, spec. 100.

Lubricating Oils

Prices in Effect	April 29	April 22
WESTERN PENNA.		
Prices are for sales made, or offers reliably reported, to jobbers & compounders only.		
Viscous Neutrals—*No. 3 col. Vis. at* 70°*F.*		
200 Vis. (180 at 100°) 420-425 fl.		
0 p.t.	38 (1)	38 (1)
10 p.t.	37 (1)	37 (1)
15 p.t.	36 (1)	36 (1)
25 p.t.	28-33	28-33
150 Vis. (143 at 100°) 400-405 fl.		
0 p.t.	36 (1)	36 (1)
10 p.t.	35 (1)	35 (1)
15 p.t.	34 (1)	34 (1)
25 p.t.	26-31	26-31

NOTE: Limited quantity neutrals available to regular trade.

Cylinder Stocks:

Brl. stk., 145-155 *vis. at* 210°, 540-550 fl., *No. 3 col.*

10 p.t.	30.5 (1)	30.5 (1)
15 p.t.	29.5 (1)	29.5 (1)
25 p.t.	25	25
600 S.R. filterable	15	15
650 S.R.	15.5	15.5
600 fl.	16	16
630 fl.	17	17
MID-CONTINENT (F. o. b. Tulsa)		
Neutral Oils (*Vis. at* 100° *F. to* 10 *P.P.*)		
Pale Oils:		
Vis. Color		
60-85—No. 2	7.5 - 8	7.5 - 8
86-110—No. 2	7.5-8.5(2)	7.5-8.5(2)
150—No. 3	11.5 -12	11 -12
180—No. 3	12 -15	11.5 -15
200—No. 3	12 -15	12 -15
250—No. 3	14 -16.5	14 -16.5
280—No. 3	15 -16	15 -16
300—No. 3	16.5-17(2)	16.5-17(2
Red Oils:		
180—No. 5	12(1)	12(1)
200—No. 5	12.5(1)	12.5(1)
300—No. 5	16.5-17.5(2)	16.5-17.5(2)
Bright Stock—*Vis. at* 210°		
200 Vis. D	27 (1)	27 (1)
150-160 Vis. D:		
0 to 10 p.p.	23	23
10 to 25 p.p.	22.5-23	22.5-23
25 to 40 p.p.	23 (1)	23 (1)
150-160 Vis. E	22 (1)	22 (1)
120 Vis. D:		
0 to 10 p.p.	22 (2)	22 (2)
600 S.R. Dark Green	8.5 (1)	8.5 (1)
600 S.R. Olive Green	10-11(2)	10-11 (2)
SOUTH TEXAS (Neutral Oils)		
Pale Oils (*Vis. at* 100° *F.*)		
Vis. Color		
100 No. 1½-2½	6.5	6.5
200 No. 2-3	8.75	8.75
300 No. 2-3	9.25	9.25
500 No. 2½-3½	10	10
750 No. 3-4	10.25	10.25
1200 No. 3-4	10.375	10.375
2000 No. 4	10.5	10.5

(Continued on next page)

NOTE:—Parenthetical figures after prices indicate number of companies quoting when less than three companies are quoting.

Refinery Prices—Continued

Prices in Effect	April 29	April 22
Red Oils:		
100 No. 5-6	6.5 (2)	6.5 (2)
200 No. 5-6	8.75	8.75
300 No. 5-6	9.25	9.25
500 No. 5-6	10	10
750 No. 5-6	10.25	10.25
1200 No. 5-6	10.375	10.375
2000 No. 5-6	10.5	10.5

CHICAGO (From Mid-Continent p.l. crude). Neutral oils *vis. at* 100° *F. 0 to* 10 *p.p.*

Pale Oils:

Vis Color		
60-85—No. 2	9 (1)	9 (1)
86-100—No. 2	9.25(1)	9.25(1)
150—No. 3	12.5(1)	12.5(1)
180—No. 3	13(1)	13(1)
200—No. 3	13(1)	13(1)
250—No. 3	14(1)	14(1)
Red Oils:		
180—No. 5	13(1)	13(1)
200—No. 5	13(1)	13(1)
250—No. 5	14(1)	14(1)
280—No. 5	15(1)	15(1)
300—No. 5	15.5(1)	15.5(1)

Note: Viscous oils, 15 to 30 p.p. are quoted 0.5c lower; 60-85 and 86-110 No. 2 non-viscous oils, 15 to 30 p.p., 0.25c lower.

Unfiltered Steam Refined (*Viscosity at* 210°)		
140	11.5(1)	11.5(1)
160	12.5(1)	12.5(1)
200	13.5(1)	13.5(1)
Bright stocks, 160 *vis. at* 210 *No.* 8 *color:*		
0 to 10 p.p.	24(1)	24(1)
15 to 25 p.p.	23.5(1)	23.5(1)
30 to 40 p.p.	21.5(1)	21.5(1)
E filtered Cyl. Stock	15.5(1)	15.5(1)

Note: To obtain prices delivered in Chicago add 0.25c per gal.

Natural Gasoline

(Group 3 & Breckenridge prices are to blenders on freight basis shown below. Shipments may originate in any Mid-Continent manufacturing district.)

FOB GROUP 3		
Grade 26-70	2.75 (Sale)	2.75 (Sale)
FOB BRECKENRIDGE		
Grade 26-70	2.25(Quotes)	2.25 (Quotes)
CALIFORNIA (FOB plants in Los Angeles basin)		
21-21.9 pound vapor pressure for blending	4.71–4.85(1)	4.71–4.85 (1)

Naphtha and Solvent

(*FOB Group* 3)		
Stoddard solvent	6.5 – 6.625	6.5 –6.625
Cleaners' naphtha	7.125	7.125
V.M.&P. naphtha	7.1 –7.125	7.1 – 7.125
Mineral spirits	6.1 – 6.125	6.1 – 6.125
Rubber solvent	7.1 – 7.125	7.1 – 7.125
Lacquer diluent	7.375– 8.125	7.375– 8.125
Benzol Diluent	7.875– 8.625	7.875– 8.625
WESTERN PENNA.		
Other Districts:		
Untreated naphtha	7 –7.25(2)	7 –7.25(2)
Stoddard solvent	7.25 – 7.5	7.25 – 7.5

OHIO (S. O. quotations for statewide delivery:)

V.M.&P. naphtha	D.C. naphtha, Varnolene &	
Sohio solvent	9.5	9.5
Rubber solvent	9	9

E. TEXAS (Truck Tnspt.)		
Stoddard Solvent	7(2)	7(2)

Wax

WESTERN PENNA. (Bbls. C.L.)		
White Crude Scale:		
122-124 A.m.p.	4.25(2)	4.25(2)
124-126 A.m.p.	4.25	4.25
MID-CONTINENT (C.L. FOB Refinery)		
Semi-refined:		
132-134 AMP, bbls.	5.25(1)	5.25(1)

CHICAGO (FOB Chicago district refinery of one refiner, in bags, carloads. Carloads, slabs loose, 0.4c less. Melting points are EMP (ASTM) methods; add 3° to convert into AMP.)

Fully refined:		
122-124 (bags only)	5.6	5.6
125-127	6	6
127-129	6.25	6.25
130-132	6.55	6.55
132-134	6.8	6.8
135-137	7.55	7.55

Petrolatums

WESTERN PENNA. (Bbls., carloads; tank cars, 0.5c per lb. less.)		
Snow White	6.5 –7.125	6.5 – 7.125
Lily White	5.75 –6.375	5.75 – 6.375
Cream White	5 –5.875	5 – 5.875
Light Amber	3.375–4	3.375– 4
Amber	3.5 –3.75	3.5 – 3.75
Red	3.5 –3.625(2)	3.5–3.625(2)

Tank Wagon Prices

Commercial or consumer tank car, tank wagon, dealer, and service station prices for gasoline **do not include taxes**; *they do, however, include inspection fees as shown in general footnote. Gasoline taxes, shown in separate column, include 1.5c federal, and state taxes; also city and county taxes as indicated in footnotes. Kerosine tank wagon prices also do not include taxes; kerosine taxes where levied are indicated in footnotes. Dealer discounts are shown in footnotes. These prices in effect April 29, 1946 as posted by principal marketing companies at their headquarters offices, but subject to later correction.*

ATLANTIC REFINING

	Atlantic White Flash (*Regular Grade*) Commercial T.W.	Dealer T.W.	Gasoline Taxes	Kerosine T.W.
Philadelphia, Pa	8.7	9.2	5.5	11.25
Pittsburgh	9.5	10	5.5	11.6
Allentown	9	9.5	5.5	11.6
Erie	9.5	10	5.5	11.6
Scranton	9.5	10	5.5	11.6
Altoona	9.5	10	5.5	11.6
Emporium	9.5	10	5.5	11.6
Indiana	9.5	10	5.5	11.6
Uniontown	9.5	10	5.5	11.6
Harrisburg	9	9.5	5.5	11.6
Williamsport	9.5	10	5.5	11.6
Dover, Del.	...	9.7	5.5	11.6
Wilmington, Del.	...	9.2	5.5	11.1
Boston, Mass.	...	°9.7	4.5	....
Springfield, Mass.	...	°10.6	4.5	....
Worcester, Mass.	...	°10.0	4.5	....
Fall River, Mass.	...	°9.7	4.5	....
Hartford, Conn.	...	°10.1	4.5	....
New Haven, Conn.	...	°9.7	4.5	....
Providence, R. I.	...	°9.7	4.5	....
Atlantic City, N. J.	...	9.2	4.5	9.0
Camden, N. J.	...	9.2	4.5	9.0
Trenton, N. J.	...	9.2	4.5	9.0
Annapolis, Md.	...	9.55	5.5	9.8
Baltimore, Md.	...	8.95	5.5	8.8
Hagerstown, Md.	...	10.05	5.5	9.3
Richmond, Va.	...	9.5	6.5	11.3
Wilmington, N. C.	...	9.8	7.5	10.9
Brunswick, Ga.	...	9.5	7.5	*10.1
Jacksonville, Fla.	...	9.5	8.5	11.1

	Mineral Spirits T.W.†	V.M.&P. T.W.†
Philadelphia, Pa.	11	12.5
Lancaster, Pa.	12	13.5
Pittsburgh, Pa.	12.5	13.5

FUEL OILS—T.W.

	1	2	3	5	6
Phila., Pa.	9.1	8.0	8.0	5.65	4.94
Allentown, Pa.	9.6	8.3	8.3	....	....
Wilmington, Del.	9.1	8.0	8.0	....	....
Springfield, Mass.	...	8.4	8.4	....	....
Worcester, Mass.	...	8.4	8.4	....	....
Hartford, Conn.	...	8.2	8.2	....	....

*Does not include 1c Georgia kerosine tax.

†Mineral Spirits prices also apply to Stoddard Solvent; V.M.&P. prices also apply to Light Cleaners Naphtha.

Discounts:

Gasoline—to undivided dealers, 0.5c off dealer t.w. except Georgia & Florida dealer t.w. and undivided dealer t.w. prices are same.

Kerosine—Thru Penna. & Delaware, 2c off t.w. price on t.w. deliveries of 25 gals. or more at one time.

°Effective April 24.

CONT'L OIL

	Conoco N-tane (regular) †Tank	Demand (3rd Grade) Wagon	Gasoline Taxes	Kerosine T.W.
Denver, Col.	10	9	5.5	10.5
Grand Junc., Col.	12.5	11.5	5.5	13
Pueblo, Col.	9.5	8.5	5.5	10
Casper, Wyo.	11.5	10.5	5.5	12.5
Cheyenne, Wyo.	10	9	5.5	9.5
Billings, Mont.	12	11	6.5	13
Butte, Mont.	11.5	10.5	6.5	14
Great Falls, Mont.	12	11	6.5	13
Helena, Mont.	12	11	6.5	13.5
Salt Lake City, Utah	13.5	12.5	5.5	15
Twin Falls, Ida.	14.5	13.5	7.5	17.5
Albuquerque, N. M.	10.5	9.5	*7	10
Roswell, N. M.	10	9	*7	7.5
Santa Fe, N. M.	10.5	9.5	*7.5	10.5
Ft. Smith, Ark.	9	6.25	8	8.5
Texarkana, Ark.	8.7	7.2	*5.5	7.5
Muskogee, Okla.	7.75	6.75	9	8.5
Oklahoma City, Okla.	8	7	9	8.5
Tulsa, Okla.	8	7	9	8.5

*Taxes: In gasoline tax column are included these city taxes—Albuquerque, & Roswell, 0.5c, Santa Fe, 1c. Texas 4c state tax applies within city limits of Texarkana Ark.

†To consumers & Dealers.

HUMBLE OIL

	Humble (*Regular*) *Tank Wagon	Re-tail	Thriftane (*3rd Grade*) *Tank Wagon	Re-tail	Gasoline Taxes
Dallas, Tex.	*7.5	10.5	*6.5	8.5	5.5
Ft. Worth, Tex.	*7.5	10.5	*6.5	8.5	5.5
Houston, Tex.	8.5	12.5	7.5	10.5	5.5
San Ant., Tex.	8.5	12.5	7.5	10.5	5.5

*Consumer t.w. prices are 1c per gal. higher than dealer t.w. prices shown above.

	Kerosine *Tank Wagon	Retail
Dallas, Tex.	7.5	10.5
Ft. Worth, Tex.	7.5	11.5
Houston, Tex.	8.5	11.5
San Antonio, Tex.	7.5	10.5

*To all classes of dealers & consumers.

Canada

PRICES OF IMPERIAL OIL, LTD.

Per Imperial Gallon, which is 1.2 U. S. Gallons

IMPERIAL OIL

	Esso Gasoline (*Regular Grade*) †Gasoline T.W.	*Gasoline Taxes	Kerosine T.W.
Hamilton, Ont.	16.5	11	18
Toronto, Ont.	16.5	11	18
Brandon, Man.	21.5	10	23.5
Winnipeg, Man.	20.0	10	22
Regina, Sask.	19.5	11	21.5
Saskatoon, Sask.	22.3	11	24.3
Edmonton, Alta.	20.4	10	22.4
Calgary, Alta.	17.5	10	19.5
Vancouver, B. C.	15	10	24
Montreal, Que.	16.5	11	°17.5
St. John, N. B.	16	13	19
Halifax, N. S.	16	13	19

*Includes 3c Federal, and Provincial taxes

†To divided & undivided dealers

°This price was shown incorrectly in NPN of April 24.

SOCONY VACUUM

	Socony Mobilgas (*Regular Grade*) Com. Cons. T.W.	Undiv. Dlr. T.W.	Gasoline Taxes
New York City			
Manhattan & Bronx	°8.7	°9.2	*5.5
Kings & Queens	°8.7	°9.2	*5.5
Richmond	°8.5	°9.0	*5.5
Albany, N. Y.	°8.6	°9.1	5.5
Binghamton, N. Y.	9.8	10.3	5.5
Buffalo	9.0	9.5	5.5
Jamestown, N. Y.	9.2	9.7	5.5
Mt. Vernon, N. Y.	°8.8	°9.3	5.5
Plattsburg, N. Y.	°9.8	°10.3	5.5
Rochester, N. Y.	9.6	10.1	5.5
Syracuse, N. Y.	9.3	9.8	5.5
Bridgeport, Conn.	°8.7	°9.2	4.5
Danbury, Conn.	°9.2	°9.7	4.5
Hartford, Conn.	°9.1	°9.6	4.5
New Haven, Conn.	°8.7	°9.2	4.5
Bangor, Me.	9.5	10.0	5.5
Portland, Me.	°9.1	°9.6	5.5
Boston, Mass.	°8.7	°9.2	4.5
Concord, N. H.	°10.2	°10.7	5.5
Lancaster, N. H.	°10.8	°11.3	5.5
Manchester, N. H.	°9.9	°10.4	5.5
Providence, R. I.	°8.7	°9.2	4.5
Burlington, Vt.	°9.7	°10.2	5.5
Rutland, Vt.	°9.7	°10.2	5.5

°Effective April 23.

	Mineral Spirits T.W.	V.M.&P T.W.
Buffalo, N. Y.	10.9	11.7
New York City	11	12
Rochester, N. Y.	11.8	13
Syracuse, N. Y.	12.2	16.4
Boston, Mass.	12	13
Bridgeport, Conn.	†16.3	†17.3
Hartford, Conn.	†16.3	†17.3
Providence, R. I.	13	14

	Kerosine Yard	T.W.	Mobilfuel Diesel T.C.	T.W.	Mobilheat Fuel Yard	T.W.
New York City:						
Manhat'n & Bronx	6.5	9.3	...	8.3	6.1	8.0
Kings & Queens	6.5	9.3	...	8.3	6.1	8.0
Richmond	6.5	9.3	...	...	6.1	8.0
Albany	6.5	8.8	5.8	8.3	6.0	8.0
Binghamton	7.9	10.2	...	9.7	7.4	9.2
Buffalo	7.6	9.9	7.0	9.3	7.2	9.0
Jamestown	7.7	10.0	...	9.6	7.3	9.0
Mt. Vernon	6.6	9.3	...	8.4	6.2	8.0
Plattsburg	7.1	9.4	...	8.9	6.6	8.4
Rochester	7.7	10.0	6.9	9.2	6.9	8.7
Syracuse	7.5	9.8	6.8	9.1	6.8	8.6
Conn.:						
Bridgeport	6.8	9.3	...	8.5	6.3	8.0
Danbury	7.2	9.8	...	...	6.8	7.5
Hartford	7.0	9.5	...	8.5	6.4	8.2
New Haven	6.3	9.3	6.0	8.3	5.9	8.0
Maine:						
Bangor	6.9	9.3	6.4	8.7	6.4	8.1
Portland	6.5	9.2	5.8	8.3	6.0	8.0

Tank Wagon Prices—Continued

	Kerosine Yard	Kerosine T.W	Mobilfuel Diesel T.C.	Mobilfuel Diesel T.W.	Mobilheat Fuel Yard	Mobilheat Fuel T.W.
Mass.:						
Boston	6.8	9.6	5.8	8.3	6.2	8.1
N. H.:						
Concord	7.4	9.7	...	9.6	7.3	9.1
Lancaster	8.5	10.8	...	10.5	8.2	10.0
Manchester	7.5	10.1	...	9.3	7.0	8.8
R. I.:						
Providence	6.8	9.3	5.8	8.3	6.2	8.1
Vermont:						
Burlington	7.1	9.4	6.5	8.8	6.5	8.2
Rutland	7.3	9.6	...	9.0	6.7	8.5

*Does not include 1% city sales tax applicable to price of gasoline (ex tax).
†In steel barrels.
Discounts: Diesel—On t.w. deliveries, 0.5c for at least 400 gals.; 1c for full tank truck.

S. O. CAL.

	Chevron (Regular) T.T.	Chevron (Regular) Retail	Chevron Av. 73 T.T.	Gasoline Taxes	Kerosine T.T.
San Francisco, Cal.	10	14	12.5	4.5	12.25
Los Angeles, Cal.	9.5	13.5	12	4.5	10.75
Fresno, Cal.	11	15	13.5	4.5	13.25
Phoenix, Ariz.	12	16	14.5	6.5	13.25
Reno, Nev.	12	16	14.5	5.5	14.25
Portland, Ore.	10.5	14.5	13	6.5	14.25
Seattle, Wash.	10.5	14.5	13	6.5	14.25
Spokane, Wash.	12.5	16.5	16	6.5	17.25
Tacoma, Wash.	10.5	14.5	13	6.5	14.25
Boise, Ida.	13.5	17.5	16	7.5	17

Resale and Commercial Gasoline:—Tank car deliveries of Chevron Aviation 73, and Chevron Gasoline .25c per gallon below posted net tank truck price. Pearl Oil (The Standard Kerosine):—Tank car deliveries 3c below posted tank truck price.

S. O. IND.

Red Crown (Reg Grade) Blue Crown (3rd Grade)

	Red Cr'n. Cons. T.W.	Red Cr'n. Dlr. T.W.	Blue Cr'n. Dlr. T.W.	Gasoline *Taxes	Kerosine T.W
Chicago, Ill.	11.6	9.6	9.1	4.5	11.1
Decatur, Ill.	11.3	9.6	8.7	4.5	10.8
Joliet, Ill.	11.6	10.1	9.2	4.5	11.1
Peoria, Ill.	11.4	9.9	9.4	4.5	10.9
Indianapolis, Ind.	11.3	9.8	9.3	5.5	10.6
Evansville, Ind.	11.1	9.6	8.6	5.5	10.4
South Bend, Ind.	11.7	10.2	9.7	5.5	11.0
Detroit, Mich.	11.1	9.6	...	4.5	10.5
Grand Rapids, Mich.	11.1	9.6	...	4.5	10.4
Saginaw, Mich.	11.1	9.6	...	4.5	10.4
Green Bay, Wisc.	11.9	10.4	9.9	5.5	11.4
Milwaukee, Wis.	11.8	10.3	9.8	5.5	11.3
La Crosse, Wis.	11.6	10.1	9.6	5.5	11.1
Minneapolis - St. Paul	11.6	10.1	9.6	5.5	11.1
Duluth, Minn.	11.9	10.4	...	5.5	11.4
Mankato, Minn.	11.6	10.1	9.6	5.5	11.1
Des Moines, Ia.	11.1	9.6	9.1	5.5	10.6
Mason City, Ia.	11.4	9.9	9.4	5.5	10.9
St. Louis, Mo.	11.0	9.5	9.1	4.5	10.6
Kansas City, Mo.	10.7	9.2	8.6	4.5	10.2
St. Joseph, Mo.	10.7	9.2	....	4.5	10.4
Fargo, N. D.	12.6	11.1	10.6	5.5	12.1
Huron, S. D.	12.0	10.5	10.0	5.5	11.5
Wichita, Kans.	9.5	8.6	7.2	5.5	9.5
Omaha, Neb.	11.1	9.6	9.1	6.5	10.6

Stanavo Ethyl Aviation Number 73

	Cons. T. W.	*Taxes
Detroit, Mich.	15.7	4.5
Fargo, N. D.	15.1	5.5
Huron, S. D.	14.5	5.5
Indianapolis, Ind.	14.2	5.5
Kansas City, Mo.	13.2	4.5

	Oleum Spirits	V.M.&P. Naphtha	Stanisol	*Taxes
(Prices are base prices before discounts)				
Chicago	13.5	13.8	12.8	4.5
Detroit	15.8	15	16.3	4.5
K. C., Mo.	13.3	14.3	13.8	1.5
St. Louis, Mo.	13.7	14.7	13.2	1.5
Milwaukee	14.4	15.4	14.9	5.5
Minneap'lis	14.2	15.2	13.5	5.5

Fuel Oils T.W. Chicago

	Standard Heater Oil	Stanolex Furnace Oil
1-99 gals.	9.8	9.3
100-149 gals.	8.8	8.3
150 gals. & over	8.3	...
150-399 gals.	...	8.3
400 gals. & over	...	7.8

	Stanolex Fuel A	Stanolex Fuel C
1-749 gals.	7.0	6.2
750 gals. & over	6.25	5.45

Stanolex Furnace Oil

Other Points	1-99 gals.	100 gals. & over
Indianapolis	9.5	8.5
Detroit	9.2	8.2
Milwaukee	9.5	8.5
Minneapolis	9.6	8.6
St. Louis	8.9	7.9
Kansas City	8.6	7.6

*Taxes: In gasoline tax column are included these city taxes—Kansas City, St. Joseph and St. Louis, 1c. Iowa kerosine prices are ex 4c state tax. In naphtha tax column are included 1.5c federal tax and state taxes. State sales, occupation, consumer and use taxes to be added where applicable.

S. O. KY.

Crown Gasoline (*Regular*)

	†Crown Net Dealer	Gasoline Taxes	Kerosine T.W.
Covington, Ky.	9.5	6.5	9.8
Lexington, Ky.	10.25	6.5	9.8
Louisville, Ky.	9.75	6.5	9.3
Paducah, Ky.	9.75	6.5	9.3
Jackson, Miss.	9.5	7.5	*9.5
Vicksburg, Miss.	9.25	7.5	*9.0
Birmingham, Ala.	9.75	*8.5	9.5
Mobile, Ala.	9	*9.5	9.0
Montgomery, Ala.	10.00	*9.5	*10.5
Atlanta, Ga.	10.25	7.5	*11.1
Augusta, Ga.	10.25	7.5	*10.6
Macon, Ga.	10.25	7.5	*11.1
Savannah, Ga.	9.5	7.5	*10.1
Jacksonville, Fla.	9.5	8.5	9.1
Miami, Fla.	9.5	8.5	9.1
Pensacola, Fla.	9	*9.5	8.5
Tampa, Fla.	9.5	8.5	9.1

*Taxes: In tax column are included these city and county gasoline taxes: Mobile, 2c city; Birmingham, 1c city, Montgomery, 1c city and 1c county; Pensacola, 1c city. Georgia and Montgomery, Ala. have 1c kerosine tax, Mississippi 0.5c, included in above prices.
†Consumer t.w. prices are same as net dealer prices.

S. O. N. J.

Esso (*Regular Grade*)

	Consumer Tank Wagon	Dealer T.W.	Gasoline Taxes	Kerosine T.W.
Atlantic City, N. J.	8.70	9.20	4.5	9.0
Newark	8.70	9.20	4.5	9.0
Annapolis, Md.	9.05	9.55	5.5	...
Baltimore	8.45	8.95	5.5	8.8
Cumberland	9.85	10.35	5.5	10.3
Washington, D. C.	8.70	9.20	4.5	9.3
Danville, Va.	9.60	10.10	6.5	9.7
Petersburg	9.25	9.75	6.5	9.3
Norfolk	8.70	9.20	6.5	9.0
Richmond	9.00	9.50	6.5	9.3
Roanoke	10.20	10.70	6.5	10.0
Charleston, W. Va.	10.30	10.80	6.5	11.1
Parkersburg	10.30	10.80	6.5	10.8
Wheeling	10.05	10.55	6.5	11.4
Charlotte, N. C.	9.80	10.30	7.5	9.6
Hickory	10.20	10.70	7.5	10.6
Mt. Airy	10.40	10.90	7.5	9.8
Raleigh	10.10	10.60	7.5	10.6
Salisbury	9.90	10.40	7.5	11.0
Charleston, S. C.	9.20	9.70	7.5	...
Columbia	10.10	10.60	7.5	...
Spartanburg	9.60	10.10	7.5	...
New Orleans, La.	8.45	8.95	8.5	*7.5
Baton Rouge	8.45	8.95	8.5	*8.0
Alexandria	8.45	8.95	8.5	*8.0
Lake Charles	8.70	9.20	8.5	*9.5
Shreveport	8.20	8.70	8.5	*6.5
New Iberia, La.	8.70	9.20	8.5	*7.5
Knoxville, Tenn.	9.95	10.45	8.5	11.0
Memphis	8.90	9.40	8.5	9.0
Chattanooga	9.70	10.20	8.5	9.5
Nashville	10.20	10.70	8.5	8.5
Bristol	9.45	9.95	8.5	10.5
Little Rock, Ark.	9.20	9.70	8.0	10.5

	Mineral Spirits T.W.	V.M.&P. T.W.
Newark, N. J.	13	14.5
Baltimore, Md.	15.5	....
Washington, D. C.	15.5	....

Fuel Oils—T.W.	No. 1'	No. 2
Atlantic City, N. J.	9.0	8.0
Newark	9.0	8.0
Baltimore, Md.	8.8	8.0
Washington, D. C.	9.3	8.4
Norfolk, Va.	9.0	7.8
Petersburg	9.3	8.0
Richmond	9.3	8.0
Charlotte, N. C.	9.6	9.4
Hickory	...	9.0
Raleigh	10.6	9.1
Charleston, S. C.	...	8.0
Columbia	...	9.0
Spartanburg	...	9.8

*Does not include 1c Louisiana kerosine tax.
Discounts:
Esso gasoline—to undivided dealers, 0.5c off dealer t.w.
Kerosine—In South Carolina 1c per gal. off posted t.w. price for 25 gals. or more. In Arkansas 2c per gal. off posted t.w. price.
Naphtha—To buyers taking following quantities at one time: Newark, 2c per gal. on 200 gals. or more, less than 200 gals. 0.5c higher price; Baltimore, 2c off on 25 to 100 gals. and 3c on over 100 gals.; Washington, 2c off to contract buyers.

S. O. OHIO

	Sohio X-70 (*Regular Grade*) Consumer T.W.	Sohio X-70 (*Regular Grade*) Resellers	Gasoline **S.S.	Gasoline Taxes	Kerosine T.W.
Ohio, Statewide.††	12	10	13.5	5.5	9.8
Akron	12	9.5	12.5	5.5	9.8
Canton	12	9.5	12.5	5.5	9.8
Cincinnati	12	9.5	12.5	5.5	9.8
Cleveland	12	9.5	12.5	5.5	9.8
Columbus	12	9.5	12.5	5.5	9.8
Dayton	12	9.5	12.5	5.5	9.8
Lima	12	9.5	12.5	5.5	9.8
Mansfield	12	9.5	12.5	5.5	9.8
Marion	12	9.0	12.0	5.5	9.8
Portsmouth	12	9.5	12.5	5.5	9.8
Toledo	12	9.5	12.5	5.5	9.8
Youngstown	12	9.5	12.5	5.5	9.8
Zanesville	12	9.5	12.5	5.5	9.8

Aviation Gasoline—Statewide

	Consumer Gasoline T.W.	Taxes
Sohio Aviation Gasoline Clear Spec. AN-F-22, Amend. 1	14.5	5.5
Esso Ethyl Avia. Grade 73	15.5	5.5
Esso (Clear) Avia. Grade 80	16.5	5.5
Esso Aviation Grade 91/98.	17.5	5.5
Esso Aviation Grade 100/130	20.5	5.5

Naphtha—T.W.

	Statewide
S. R. Solvent	13.5
D. C. Naphtha	14
V.M.&P. Naphtha	14
Varnolene	14
Sohio Solvent	14

Fuel Oils—T.W.	No. 1	No. 2	No. 3	No. 4
Ohio, Statewide	8.8	8.8	8.3	*8.05

**Renown (third-grade) prices are same as X-70 unless otherwise noted.
*Prices at company-operated stations.
††Statewide prices are subject to exceptions other than those shown
Discounts:
Esso aviation—on contract to hangar operators and resellers 2c off consumer t.w.
*For Cleveland area only. Full compartment hose dumps.
Fuel oils—Statewide prices are for t.w. & drum deliveries of 50 gals. or more; prices for deliveries of less than 50 gals. are 0.5c higher.
Naphthas—to contract consumers off t.w. prices—Statewide: 300 to 999 gals., 0.5c; 1000 to 2499 gals., 0.75c; 2500 to 4999 gals., 1c; 5000 or more gals. 1.5c. Lucas County: Less than 50 gals., tank wagon price, 50 to 249 gals., 0.5c; 250 to 499 gals., 1c; 500 gals. or over, 1.5c.

TEXAS CO.

	Gasoline—Dealer T.W. Fire-Chief (*Regular*)	Indian (*3rd Grade*)	Gasoline Taxes
Dallas, Tex.	7.5	6.5	5.5
Ft. Worth, Tex.	7.5	6.5	5.5
Wichita Falls, Tex.	8.5	7.5	5.5
Amarillo, Tex.	8.5	7.5	5.5
Tyler, Tex.	8.5	7.5	5.5
El Paso, Tex.	11	10.5	5.5
San Angelo, Tex.	8.5	7.5	5.5
Waco, Tex.	8.5*	7*	5.5
Austin, Tex.	8.5	7.5	5.5
Houston, Tex.	8.5	7.5	5.5
San Antonio, Tex.	8.5	7.5	5.5
Port Arthur, Tex.	8.5	7.5	5.5

*Less 1c temporary allowance to all dealers.

Notice

Tank Wagon prices include inspection fees on both gasoline and kerosine unless otherwise specified per gallon as follows:

Ala. 1/40c on gasoline; Ark. 1/20c; Fl. 1/8c; Ill. 3/100c; Ind. 2/25c; Kans. 1/50c; La. 1/32c; Minn. 7/200c; Neb. 2/100c; Nev. 1/20c; N. C. 1/4c; N. Da. 1/20c; Okla. 2/25c; S. Car. 1/8c; S. Da. 1/40c; Tenn. 2/5c; and Wisc. 3/100c.

Kerosine inspection fees only: Ala. 1/2c; Fla. 1/8c; Iowa 3/50c; Mich. 1/5c per gal.

Atlantic Coast

Seaboard Export Coastwise Prices

(Prices are of refiners, FOB their refineries and tanker terminals, and of tanker terminal operators FOB their terminals)—Prices in Effect April 29

District	MOTOR GASOLINE (ASTM Octane) 74-77 Oct.	78-80 Oct. (Ethyl)	KEROSINE & FUEL OILS KEROSINE &/OR NO. 1 FUEL	NO. 2 FUEL	NO. 3 FUEL	No. 5	No. 6
N. Y. Harb.	6.375–8	7.375–8.95	6.1	5.7	5.7 (1)	$1.90 (a)	$1.72
N. Y. Harb., barges	6.275–7.6	7.275–7.9	6	5.6	5.6 (1)	....	....
Albany	7–8	8–9.5(2)	6.3	5.8	5.8 (1)	....	$1.92 (1)
Philadelphia	6.375–7.7	7.375–8.95	6.2	5.7	5.7	$1.93	$1.72
Philadelphia, barges	6.275–6.85	7.275–7.75	....	....	....	....	....
Baltimore	6.375–7.45	7.375–8.7	6.2	5.7	5.7 (1)	$1.80(1)	$1.72
Baltimore, barges	6.625–6.9	7.275–7.9	....	....	....	....	....
Norfolk	6.75–7.1	7.75(1)	6.1	5.7	....	$1.76(1)	$1.68
Wilmington, N. C.	6.65–7.35	7.65(2)	6.05	5.7	....	....	....
Charleston	6.65–7.05	7.65(2)	6.2	5.7	....	$1.71(1)	$1.63 (2)
Savannah	7–7.37	8(2)	6.05	5.25	5.25 (1)	....	$1.63 (1)
Jacksonville	7–7.375	8–8.375	6.05	5.25	....	....	$1.58–1.63
Miami	7–7.375	8–8.375	6.05	5.25 (2)	....	....	....
Tampa	7–7.375	8–8.375	6.05	5.25	....	....	$1.49–1.53
Pensacola	6.625–7(2)	....	5.3 (1)	5.25 (1)	....	....	....
Mobile	6.5–6.87(2)	....	5.25 (2)	....	....	....	....
New Orleans	6	6.75(2)	4.625	4.25 (2)	....	$1.26(1)	$1.18
Portland	7.05–8.1	7.9–9.6	6.3	5.8	5.8 (1)	$2.245 (1)	$1.765
Boston	6.9–8	7.9–9.5	6.2	5.8	5.8 (1)	$1.945	$1.765
Providence	7–8	7.85–9.5	6.2	5.8	5.8 (1)	$1.865(2)	$1.735
New Haven	....	....	....	....	....	....	$1.735(1)

(a) Price is for straight-run low pour test No. 5; three refineries quote $1.80 for high pour test No. 5.

	Bunker C Fuel Ships' bunkers (Ex Lighterage)	Diesel Oil Ships' bunkers (Ex Lighterage)	Diesel Oil Shore Plants	Gas House Gas Oil 28-34 Gravity
N. Y. Harbor	$1.72	$2.36	5.7 (1)	5.8 (2)
Albany	$1.92(1)	$2.52 (1)	5.8 (1)	6 (1)
Philadelphia	$1.72	$2.36	....	....
Baltimore	$1.72	$2.36 (2)	5.7 (1)	....
Norfolk	$1.68	$2.36 (2)	5.7 (1)	....
Charleston	$1.63(2)	$2.36 (2)	5.7 (1)	....
Savannah	$1.63 (1)	....	....	....
Jacksonville	$1.58-1.63	$2.20 (1)	....	....
Tampa	$1.49–1.53	....	....	....
New Orleans	$1.18	$1.86 (1)	....	....
Portland	$1.765	....	5.8 (1)	5.9 (1)
Boston	$1.765	$2.40 (1)	5.8 (2)	5.9 (1)
Providence	$1.735	$2.402 (2)	5.8 (1)	5.9 (1)
New Haven	....	....	....	....

Gulf Coast

Prices in Effect April 29

MOTOR GASOLINE	New Orleans & Lower Mississippi to Baton Rouge Tank Cars	Barges	Texas Gulf Coast South of New Orleans Tank Cars	Barges	CARGOES Domestic & Export From all Gulf Ports
78-80 Oct. Ethyl	6.75	6.5	....	6.5–6.75	6.375–6.75
74-77 Oct.	6	5.75	5.75–6(a)	5.75	5.625–5.75
70 Oct.	....	....	....	....	5.375–5.625
Unleaded (ASTM Oct.)					
70 Oct.	....	....	....	....	5.625
68 Oct.	....	....	....	....	5.5
65 Oct.	....	5.5	....	....	5.25–5.5
60 Oct.	....	....	....	....	5
KEROSINE & LIGHT FUELS					
41-43 w.w. kero	4.625	4.625	4.625	4.625	4.625
42-44 w.w. kero	....	....	4.625	4.625	4.625
No. 2 fuel oil	4.25	4.25	4.25	4.25	4.25
DIESEL & GAS OILS (In diesel index No.)					
No. 5 fuel oil	$1.26	$1.26	$1.26	$1.26	$1.26
43-47 di	....	....	....	....	4.5
48-52 di	4.5	4.5	4.5	4.5	4.5
53-57 di	4.625	4.625	4.625	4.625	4.625
58 and above	4.75	4.75	4.75	4.75	4.75

(a) One refiner quotes 5.75c for shipment to Dist. 1, 6c for shipment to other districts; one other refiner quotes 5.75c for unrestricted shipment.

NOTE: Above products in Truck Transports of 2,400 gal. and over 0.125c above Tank Car Prices

HEAVY FUELS & BUNKER OIL (all Gulf Ports) Heavy Diesels	In Cargoes	In Ship's Bunkers (Ex Lighterage)
Below 28 API Grav.	....	$1.35 –$1.56
28 & above API Grav.	....	$1.86
Bunker C Oil	$1.18	$1.18

TANKER RATES

Approximate rates, cents per bbl.; Gulf-N. Atlantic, not east of New York

Heavy crude & fuel, 10-19.9 grav.	43.8
Light crude, 30 grav. or lighter	39
Gasoline	32.9
Kerosine	36
No. 2 fuel	38

Mid-Continent Lubes

(At Gulf; in packages, FAS. New Orleans; in bulk, FOB terminals).

Prices in Effect April 29

Bright Stock	Steel Drums	Bulk
D color. Vis at 210°		
150 vis. 0-10 p.p.	32.65 (1)	24.8 (1)

Pacific Coast

(In Ships' Bunkers, or Deep Tank Lots)

	Prices in Effect April 29 Diesel Fuel (P.S. 200)	Bunker C Fuel (P.S. 400)
San Pedro, Calif.	$1.765	$1.25
San Francisco, Calif.	1.815	1.30
Portland, Ore.	2.015	1.45
Seattle, Wash.	2.015	1.45

Wax

(Melting points are AMP, 3° higher than EMP. Prices are FOB refinery and do not include bag freight or export differentials).

Prices in Effect April 29

Crude Scale	New Orleans Export	N. Y. Domestic	N. Y. Export
124-6 Yellow	4.25 (1)	....	4.25 (1)
122-4 White	....	4.25 (2)	4.25(2)
124-6 White	4.25 (1)	4.25	4.25
Fully Refined:			
123-5	5.2 (1)	5.2 (2)	5.2 (1)
125-7	5.2 (1)	5.2 (2)	5.2 (2)
128-30	5.6 (1)	5.6	5.6 (1)
130-32	5.85 (1)	5.85 (2)	5.85 (1)
133-5	6.15 (1)	6.15	6.15 (2)
135-7	6.4 (1)	6.4 (1)	6.4 (1)

Naphtha

Effective April 29

	V.M.&P. Naphtha	Mineral Spirits
New York Harbor	11 (2)	10
Philadelphia	11 (2)	10
Baltimore	10.5 (2)	9.5
Boston	11.5 (2)	10.5
Providence	11.5 (1)	10.5 (2)

Export Prices

Prices in Effect April 29

	Mexican Gulf Ports U. S. Dollars per Bbl. Bunker C (Ships' Bunkers)	Diesel (Ships' Bunkers)
Tampico	$1.18	$1.86
Veracruz	1.18	....
Coatzacoalcos	1.18	1.86
Pacific Coast		
Guaymas	$1.65	$3.22
Mazatlan	1.65*	3.22
Acapulco	1.65	2.89
Manzanillo	1.65	2.89
Salina Cruz	1.65	2.89

Note: All bunkers sales subject to Mexican stamp tax of 1.65% ad valorem.

*Part accessible only for small vessels drawing 14 to 15 feet.

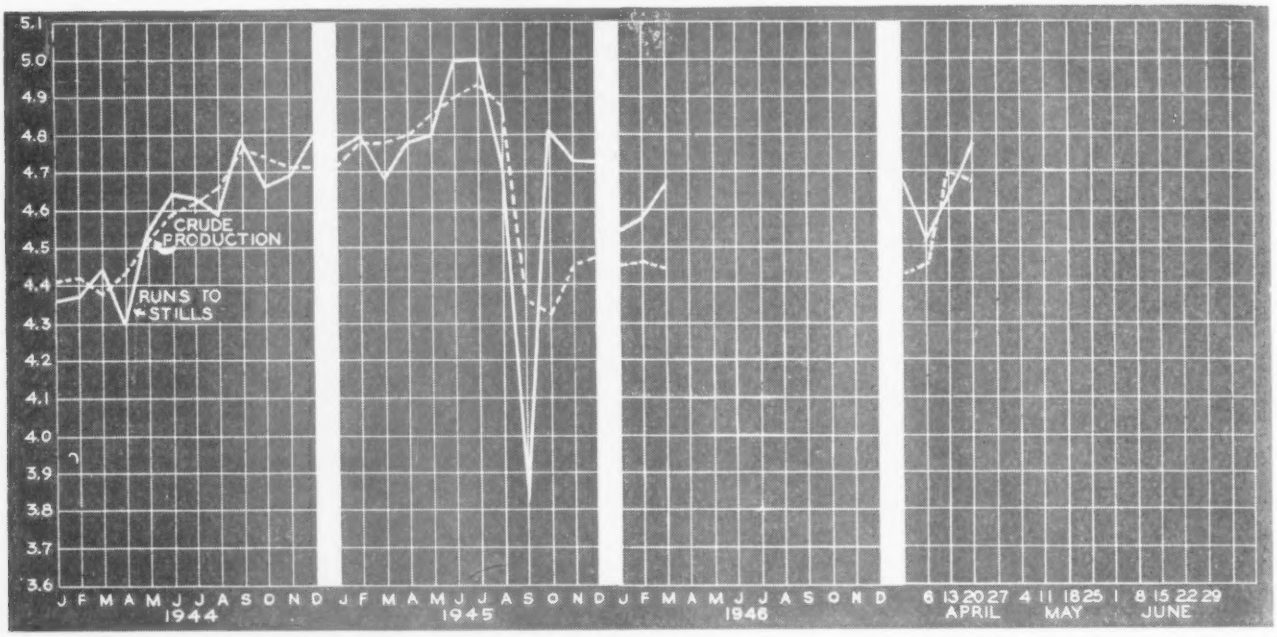
NPN Gasoline Index

	Dealer T.W.	Tank Car
	Cents Per Gal.	
April 29	9.78	6.17
Month ago	9.75	6.14
Year ago	10.39	6.72

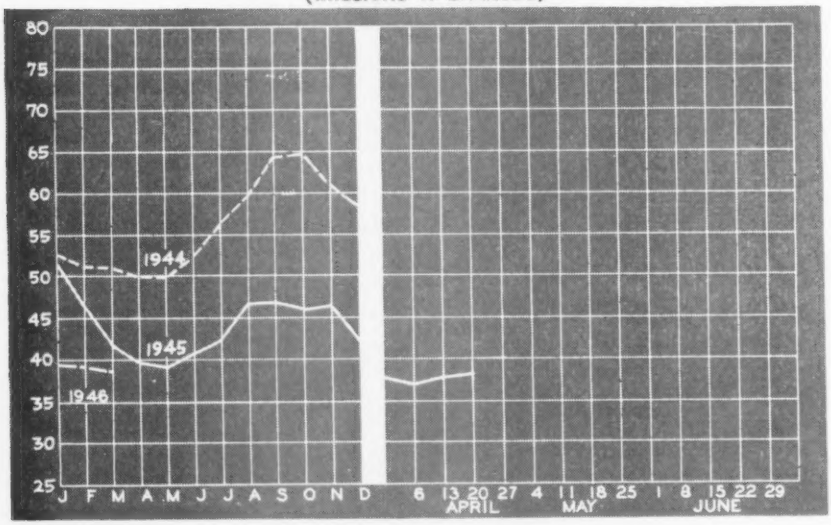
Dealer index is an average of "undivided" dealer prices, ex-tax, in 50 cities.

Tank car index is weighted average of following wholesale markets for regular-grade gasoline, FOB refineries or terminals: Okla., Mid-Western, W. Penna., Calif., N. Y. Harbor, Philadelphia, Jacksonville, Boston and Gulf Coast.

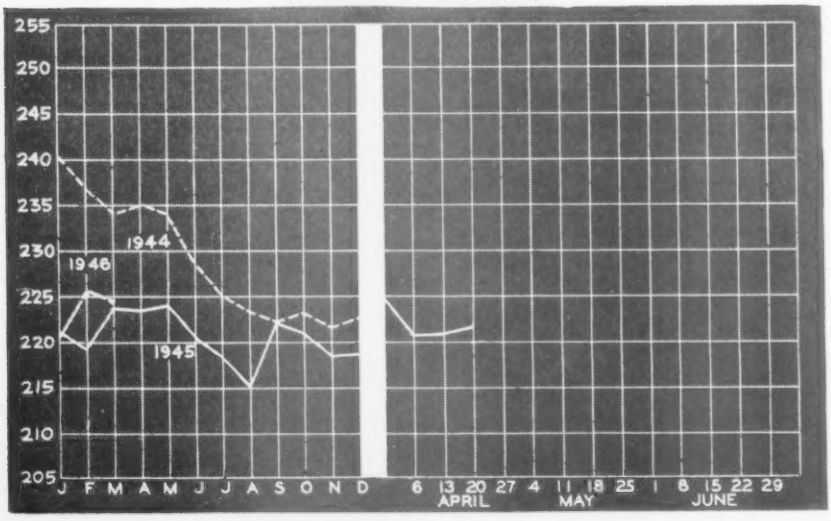
CRUDE PRODUCTION AND RUNS TO STILLS
(MILLIONS OF BARRELS)



RESIDUAL FUEL OIL STOCKS
(MILLIONS OF BARRELS)



CRUDE OIL STOCKS
(MILLIONS OF BARRELS)



Iran Crude Production

(Output of Anglo-Iranian Oil Co., Ltd.)

1939	9,583,285 tons
1940	8,626,639 tons
1941	6,605,320 tons
1942	9,399,231 tons
1943	9,705,769 tons
1944	13,274,243 tons
1945	16,839,000 tons

Crude Oil Stocks

(Bureau of Mines figures thousands of bbls.)

	April 13	April 20	Change from April 13
Penna. Grade	2,281	2,298	+ 17
Other Appalachian	1,668	1,749	+ 81
Lima-Michigan	1,070	1,096	+ 26
Illinois-Indiana	18,806	18,681	— 125
Arkansas	2,733	2,447	— 286
Kansas	8,973	8,677	— 296
Louisiana:	11,113	11,095	— 18
North	2,637	2,966	+ 329
Gulf Coast	8,476	8,129	— 347
Mississippi	2,348	2,305	— 43
New Mexico	5,598	5,495	— 103
Oklahoma	35,645	35,108	— 537
Texas:	99,696	101,101	+1,405
East Texas	15,928	16,600	+ 672
West Texas	33,962	33,989	+ 27
Gulf Texas	25,880	26,264	+ 384
Other Texas	23,926	24,248	+ 322
Panhandle	4,545	4,587	+ 42
North	6,306	6,325	+ 19
South	4,913	5,100	+ 187
Other	8,162	8,236	+ 74
Rocky Mountain	7,919	8,087	+ 168
California	20,140	20,332	+ 192
Foreign	3,270	3,218	— 52
Total gasoline-bearing in U. S.	221,260	221689	+ 429
Heavy in Calif.	4,546	4,516	— 30
Total located in Bureau of Mines E. Coast district	13,171	12,894	— 277

REFINERY OPERATIONS

(American Petroleum Institute figures in thousands of barrels of 42 gallons each. Figures include reported totals plus estimate of unreported amounts and are therefore on a Bureau of Mines basis.)

Districts	Daily Average Crude Runs to Stills Week Ended		Gasoline Production at Refineries Inc. Natural Blended Week Ended		Kerosine Production Week Ended		Gas Oil & Dist. Fuel Oil Production Week Ended		Residual Fuel Oil Production Week Ended	
	April 20	April 13	April 20	April 13	April 20	April 13	April 20	April 13	April 20	April 13
East Coast	742	733	1,758	1,749	260	193	920	943	1,702	1,049
Appalachian (Dist. 1)	94	101	295	323	34	49	85	95	81	95
Appalachian (Dist. 2)	58	56	181	161	21	23	44	30	118	86
Ind., Ill., Ky.	736	743	2,703	2,583	280	279	727	396	1,022	1,064
Okla., Kans., Mo.	385	381	1,299	1,222	195	203	364	342	481	488
Inland Texas	223	225	878	843	96	101	98	98	430	408
Texas Gulf Coast	1,193	1,144	3,606	3,209	824	739	1,569	1,700	1,988	1,876
Louisiana Gulf Coast	355	316	856	852	343	310	473	437	469	354
No. La. & Arkansas	59	51	154	126	38	31	63	56	112	89
Rocky Mt. (Dist. 3)	13	14	41	42	6	6	9	10	35	36
Rocky Mt. (Dist. 4)	119	114	351	361	23	24	112	101	190	191
California	812	758	1,907	1,880	81	27	747	757	2,592	2,512
Total U. S.—B. of M. Basis	4,789	4,636	14,029	13,351	2,201	1,985	5,211	5,265	9,230	8,608
U. S.—B. of M. Basis, April 21, 1945	4,715		15,100		1,463		4,633		9,050	

Districts	Total Stocks Kerosine Week Ended		Total Stocks Gas Oil and Distillates Week Ended		Total Stocks Residual Fuel Oil Week Ended		Stocks of Finished and Unfinished Gasoline Week Ended		Per Cent Daily Refining Capacity Reported Week Ended	
	April 20	April 13	April 20	April 13	April 20	April 13	April 20	April 13	April 20	April 13
East Coast	5,074	4,814	9,918	9,980	6,652	6,273	22,670	22,982	99.5	99.5
Appalachian (Dist. 1)	203	205	433	433	206	210	2,813	2,843	76.8	76.8
Appalachian (Dist. 2)	50	35	80	71	253	227	1,206	1,221	81.2	81.2
Ind., Ill., Ky.	1,648	1,437	3,821	3,621	3,110	3,109	22,920	23,600	87.2	87.2
Okla., Kans., Mo.	513	436	1,560	1,570	1,098	1,086	9,143	9,357	78.3	78.3
Inland Texas	326	328	318	324	744	738	3,075	3,041	59.8	59.8
Texas Gulf Coast	1,783	1,638	5,102	5,171	3,819	4,026	15,502	15,782	89.3	89.3
Louisiana Gulf Coast	819	659	1,500	1,456	938	1,066	3,944	3,964	96.8	96.8
N. La. & Arkansas	196	257	414	479	246	257	1,877	1,850	55.9	55.9
Rocky Mt. (Dist. 3)	10	15	40	38	48	43	106	114	17.1	17.1
Rocky Mt. (Dist. 4)	113	111	378	380	621	609	2,328	2,382	72.1	72.1
California	490	474	6,720	6,524	20,389	20,218	15,475	15,308	86.5	86.5
Total U. S.—B. of M. Basis	11,225	10,409	30,284	30,047	38,124	37,862	‡101,059	‡102,581	85.7	85.7
U. S.—B. of M. Basis April 21, 1945	7,940		28,576		40,376		°93,241			

Unfinished gasoline stocks included are: ‡8,888,000 bbls; °11,736,000 bbls. ‡Revised in Texas Gulf (finished gasoline) due to error by reporting company.

Daily Ave. Pennsylvania Crude Runs

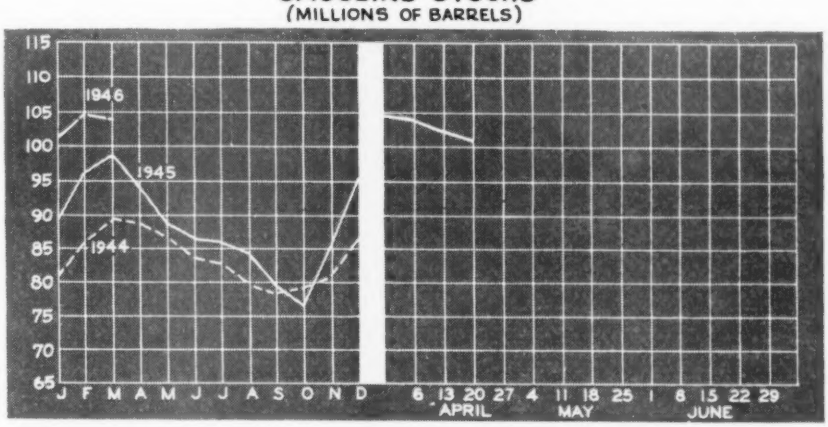
Figures on Pennsylvania crude runs were not available at NPN press time.

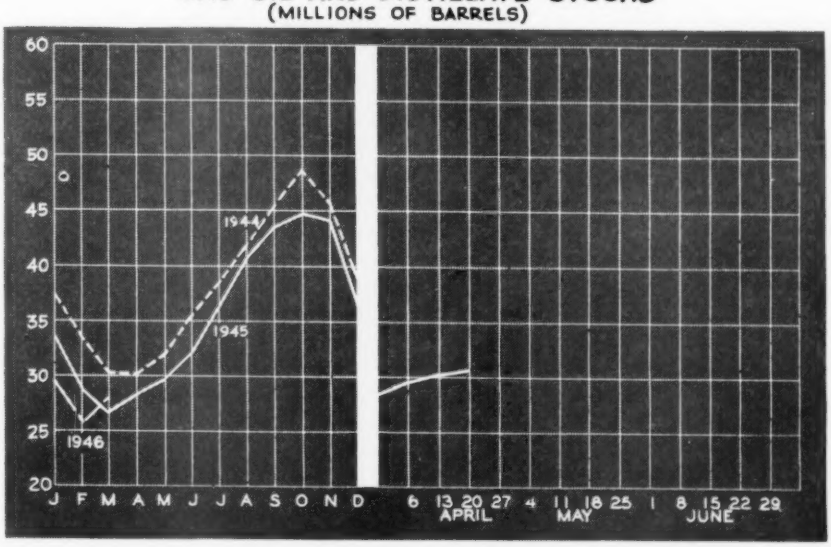
U. S. Crude Oil Production

(American Petroleum Institute figures)

	WEEK ENDED April 20 Barrels (Daily Average)	April 13 Barrels (Daily Average)
Oklahoma	°378,750	379,400
Kansas	°262,400	259,150
Nebraska	°750	750
Texas	2,054,600	2,054,600
Louisiana	372,750	372,000
Arkansas	77,500	77,900
Mississippi	55,700	55,050
Alabama	1,100	1,100
Florida	100	100
Illinois	207,600	211,950
Indiana	18,700	21,500
Eastern (Ill., Ind. & Ky. excluded)	64,750	66,100
Kentucky	31,100	30,600
Michigan	44,350	49,250
Wyoming	114,250	113,400
Montana	20,050	20,050
Colorado	26,350	25,200
New Mexico	95,800	95,800
California	859,700	857,500
Total, U. S.	4,686,300	4,691,400

°Okla., Kans., Neb. figures are for week





Pacific Coast Demand

(Bureau of Mines figures in thousands of b/d)

	Gasoline		Gas Oil & Diesel		Heavy Fuel Oil		All Products	
	1945	1946	1945	1946	1945	1946	1945	1946
January	304	248	104	139	545	432	1,066	917
February	315	283	100	129	594	439	1,124	947
March	332	...	94	...	519	...	1,068	...
April	406	...	83	...	536	...	1,148	...
May	402	...	75	...	520	...	1,133	...
June	398	...	64	...	490	...	1,085	...
July	396	...	59	...	421	...	1,011	...
August	370	...	78	...	434	...	1,010	...
September	363	...	76	...	400	...	954	...
October	269	...	76	...	443	...	897	...
November	271	...	106	...	418	...	901	...
December	265	...	117	...	479	...	969	...
Jan.-Feb.	309	264	102	134	568	535	1,093	932

Mid-Continent Lubricating Oils

(All figures are in barrels of 42 gal.)

	Bright Stock	Viscous Neutrals	Paraffin Oils	Steam Refined Stock	Blended Oils
Production	235,262	280,651	69,787	9,611	301,435
Shipments:					
Domestic	235,584	311,141	65,084	17,730	288,757
Export	8,947	53	3	455	18,793
TOTAL	244,531	311,194	65,087	18,185	307,550
Inventory Feb. 28	341,237	206,639	66,831	25,199	179,905
Days Supply	46	20	.....	.....	.....

Pennsylvania Lubricating Oils

(Compiled by National Petroleum Assn. from reports of companies refining Pennsylvania Grade crude oil. Figures in bbls.)

	Production Feb., 1946	Inventory Feb., 1946	Production Jan., 1946	Inventory Jan., 1946
Raw Long Residuum	17,997	17,799	31,805	24,447
600 Steam Refined Stock	237,295	110,656	256,866	114,723
Other Steam Refined Stock	39,619	48,006	57,962	47,351
Finished Dewaxed Long Residuum	33,090	26,664	35,132	28,655
Bright Stock	151,419	241,062	165,390	235,567
Viscous Neutral (below 180 Vis.)	53,027	130,596	54,274	128,201
Viscous Neutral (180 Vis. at 100)	99,287	90,029	93,867	80,107

Production of Natural Gasoline

(Bureau of Mines figures in gallons, 000 omitted)

	Feb. 1946	Jan. 1946
East Coast	.....	.....
W. New York	1	1
W. Pennsylvania	1,230	1,243
West Virginia	9,319	10,553
Ohio	482	594
Illinois	11,634	14,082
Kentucky	5,039	5,145
Michigan	1,007	1,107
Kansas	6,648	6,687
Oklahoma	34,533	36,901
Texas:	171,605	189,016
Gulf	41,300	48,489
East Texas	24,526	27,106
Panhandle	43,136	46,312
Other	62,643	67,109
Arkansas	6,471	7,179
Louisiana	47,960	52,147
Gulf	26,797	29,454
Inland	21,163	22,393
New Mexico	7,324	7,493
Colorado	*	*
Montana	459	518
Wyoming	*3,192	*3,591
California	71,530	78,799
Total	378,434	415,056
Daily Average	13,516	13,389
Total (thousands of bbls.)	9,011	9,882
Daily Average	322	319

*Wyoming includes Colorado and Utah drip gasoline.

Dealer and Service Station Gasoline Price in 50 Representative U. S. Cities April 1, 1946

(American Petroleum Institute Figures)

City & State	Dealers' Net Price (Ex. Tax)	Indicated Dealer Margin	Gasoline Tax (Inc. 1½ Cent Federal Tax)	Service Station (Inc. Tax)
Average United States	9.86	4.26	6.07	20.19
Portland, Me.	9.50	4.0	5.50	19.00
Manchester, N. H.	10.30	4.5	5.50	20.20
Burlington, Vt.	10.00	4.0	5.50	19.50
Boston, Mass.	9.10	4.1	4.50	17.70
Providence, R. I.	9.00	4.5	4.50	18.00
Hartford, Conn.	9.40	4.0	4.50	17.90
Buffalo, N. Y.	9.20	3.8	5.50	19.50
New York, N. Y.	9.00	5.8	5.50	20.30
Newark, N. J.	8.70	5.0	4.50	18.20
Philadelphia, Pa.	8.70	4.3	5.50	18.50
Dover, Del.	9.20	4.3	5.50	19.00
Baltimore, Md.	8.45	4.35	5.50	18.30
Washington, D. C.	8.70	4.3	4.50	17.50
Charleston, W. Va.	10.30	4.8	6.50	21.60
Norfolk, Va.	8.70	6.1	6.50	21.30
Charlotte, N. C.	9.80	3.5	7.50	21.80
Charleston, S. C.	9.20	5.0	7.50	21.70
Atlanta, Ga.	10.25	4.25	7.50	22.00
Jacksonville, Fla.	9.50	4.0	8.50	22.00
Birmingham, Ala.	9.75	4.75	8.50*	23.00
Vicksburg, Miss.	9.25	5.25	7.50	22.00
Memphis, Tenn.	8.90	4.5	8.50	21.90
Lexington, Ky.	10.25	3.75	6.50	20.50
Youngstown, Ohio	9.50	3.0	5.50	18.00
South Bend, Ind.	10.20	4.8	5.50	20.50
Chicago, Ill.	9.60	2.76	4.50	16.86
Detroit, Mich.	9.60	3.84	4.50	17.94
Milwaukee, Wisc.	10.30	4.6	5.50	20.40
Twin Cities, Minn.	10.10	4.8	5.50	20.40
Fargo, N. Dak.	11.10	4.0	5.50	20.60
Huron, S. Dak.	10.50	4.0	5.50	20.00
Omaha, Neb.	9.60	2.9	6.50	19.00
Des Moines, Ia.	9.60	3.6	5.50	18.70
St. Louis, Mo.	9.50	3.0	4.50*	17.00
Wichita, Kans.	8.60	3.4	5.50	17.50
Tulsa, Okla.	8.00	3.0	9.00	20.00
Little Rock, Ark.	9.20	4.8	8.00	22.00
New Orleans, La.	8.45	5.05	8.50	22.00
Houston, Texas	8.50	4.5	5.50	18.50
Albuquerque, N. Mex.	10.50	4.5	7.00**	22.00
Denver, Colo.	10.00	4.0	5.50	19.50
Casper, Wyo.	11.50	5.0	5.50	22.00
Butte, Mont.	9.50	4.0	6.50	20.00
Boise, Idaho	13.50	4.0	7.50	25.00
Salt Lake City, Utah	13.50	4.5	5.50	23.50
Reno, Nev.	12.00	4.0	5.50	21.50
Phoenix, Ariz.	12.00	4.0	6.50	22.50
San Francisco, Calif.	10.00	4.0	4.50	18.50
Portland, Ore.	10.50	4.0	6.50	21.00
Spokane, Wash.	12.50	4.0	6.50	23.00

* Includes City Tax of 1.00

** Includes City Tax of 0.50

Pennsylvania Oils Other Than Lubes at Refineries

(Compiled by National Petroleum Assn. from reports of oil region refiners. Figures in barrels.)

	Feb. 1946	Jan. 1946
Naphthas & Gasoline		
(1) Straight run, unblended and/or unleaded for sale as motor fuel	4,490	2,720
(2) Naphtha and gasoline, for sale for blending or further refining, or held at refinery for further distillation, reforming, blending or leading	321,736	319,949
(3) Below 65 octane, not included in (1) or (2) above	3,168	3,597
(4) 65 octane and above	399,061	409,877
Salable Naphthas other than motor fuel (does not include refinery process naphthas)	21,178	20,179
Kerosine	52,566	58,313
36/40 gas oil (include furnace oil)	54,205	61,740
Fuel oil (not reported above)	32,298	22,535
Oils held as cracking plant charging stocks	303,750	321,565
Non-viscous neutral	27,134	32,430
Wax distillate	88,888	71,064
Crude petrolatum	38,030	41,044
Wax (lbs.)	4,147,147	3,744,313

Net Stocks of Pennsylvania Crude Oil

(Compiled by National Petroleum Assn. Figures in bbls.)

	Feb. 28, 1946	Jan. 31, 1946	Feb. 28, 1945
At Refineries	245,891	265,410	265,778
Pipeline and Tank Farm	1,426,592	1,422,859	1,455,595
Total	1,672,483	1,688,269	1,721,373

EQUIPMENT PERSONALS

All directors and officers of Wayne Pump Co. have been re-elected.

At the annual meeting of stockholders held in Baltimore, following directors were renamed: **B. F. Geyer, E. J. Gallmeyer, E. A. Zern** and **Charles H. Buesching,** all of Fort Wayne; **Otis E. Kline** and **Charles C. Wells** of Chicago, and **Henry Herrman** of New York.

Officers re-elected are: Mr. Geyer, president; Mr. Gallmeyer, vice president, director of sales; Mr. Zern, vice president and treasurer; **W. F. Brandt,** vice president in charge of manufacturing; **R. J. Jauch,** vice president in charge of research; **F. S. Shumaker,** vice president and eastern sales manager; **F. J. Jaebker,** secretary; **M. R. Barnthouse,** assistant secretary; **W. Halkenmauser,** assistant secretary.

° ° °

Ralph W. Lohse has been appointed manager of sales for the Chicago District of Amco Corp. He has been with Amco since 1926 and was purchasing agent for many years.

The Seiberling brothers. F. A. (left) and C. W. (right), founders of Seiberling Rubber Co., Akron, were photographed at the recent Founder's Day Luncheon, honoring Women's National Aeronautical Assn. Shown with the Seiberlings in the first news photo they have permitted taken of themselves, is Lt. Gen. Jimmy Doolittle. Brothers Seiberling still adhere to a policy established back in 1922—to sell through independent dealers only.

GASOLINE CONSUMPTION BY STATES, JANUARY 1945

(American Petroleum Institute Figures)

	Tax Rate† January Cents	Month of Dec., 1945 Gallons	Jan., 1946 Gallons	Jan., 1945 Gallons	Change %
Alabama	6	27,547,000	28,328,000	26,091,000	+ 8.57
Arizona	5	13,818,000	13,234,000	9,700,000	+36.43
Arkansas	6½	20,407,000	18,811,000	16,081,000	+16.98
California	3	°228,810,000	221,356,000	203,396,000	+ 8.83
Colorado	4	20,207,000	20,925,000	24,168,000	—13.42
Connecticut	3	26,328,000	26,104,000	22,211,000	+17.53
Delaware	4	4,446,000	4,697,000	3,478,000	+35.05
District of Columbia	3	10,832,000	11,471,000	9,211,000	+24.54
Florida	7	44,022,000	48,605,000	34,354,000	+41.48
Georgia	6	40,181,000	41,997,000	32,309,000	+29.99
Idaho	6	8,370,000	7,649,000	5,957,000	+28.40
Illinois	3	105,424,000	103,791,000	83,261,000	+24.66
Indiana	4	54,950,000	62,039,000	55,321,000	+12.14
Iowa	4	39,402,000	43,785,000	34,873,000	+25.55
Kansas	3	34,682,000	35,630,000	30,816,000	+15.62
Kentucky	5	26,180,000	27,848,000	29,446,000	— 5.43
Louisiana	7	31,845,000	27,725,000	29,219,000	— 5.11
Maine	4	11,388,000	10,942,000	9,870,000	+10.86
Maryland	4	25,519,000	26,377,000	29,041,000	— 9.17
Massachusetts	3	52,156,000	52,506,000	43,898,000	+19.66
Michigan	3	94,604,000	95,322,000	90,106,000	+ 5.79
Minnesota	4	37,215,000	41,048,000	32,759,000	+25.30
Mississippi	6	19,646,000	19,757,000	18,215,000	+ 8.47
Missouri	2	48,851,000	55,415,000	41,724,000	+32.81
Montana	5	8,795,000	8,830,000	7,469,000	+18.22
Nebraska	5	19,530,000	21,317,000	18,173,000	+17.30
Nevada	4	3,966,000	3,623,000	3,476,000	+ 4.23
New Hampshire	4	6,575,000	6,450,000	5,051,000	+27.70
New Jersey	3	64,206,000	63,745,000	54,533,000	+16.89
New Mexico	5	11,656,000	11,681,000	8,858,000	+31.87
New York	4	128,871,000	128,358,000	105,289,000	+21.91
North Carolina	6	43,332,000	47,965,000	31,768,000	+50.99
North Dakota	4	7,627,000	8,824,000	8,140,000	+ 8.40
Ohio	4	113,338,000	112,852,000	101,626,000	+11.05
Oklahoma	7½	34,661,000	35,507,000	47,898,000	—25.87
Oregon	5	23,457,000	23,132,000	17,330,000	+33.48
Pennsylvania	4	111,247,000	113,475,000	85,252,000	+33.11
Rhode Island	3	9,874,000	9,018,000	10,959,000	—17.71
South Carolina	6	20,919,000	22,168,000	16,416,000	+35.04
South Dakota	4	8,534,000	11,254,000	8,973,000	+25.42
Tennessee	7	34,619,000	32,860,000	25,999,000	+26.39
Texas	4	179,424,000	178,098,000	416,558,000	—57.25
Utah	4	9,316,000	10,021,000	8,676,000	+15.50
Vermont	4	4,631,000	4,694,000	3,309,000	+41.86
Virginia	5	37,744,000	39,940,000	34,590,000	+17.16
Washington	5	36,004,000	34,281,000	27,160,000	+26.22
West Virginia	5	14,395,000	19,968,000	13,542,000	+47.45
Wisconsin	4	43,173,000	47,645,000	36,788,000	+29.51
Wyoming	4	6,078,000	5,848,000	6,482,000	— 9.28
Total		2,008,802,000	2,046,916,000	2,019,820,000	
Daily Average		64,800,000	66,030,000	65,155,000	
Change from previous year:					
Total Change			+1.34%		
Percentage change in Daily Average			+27,096,000		

† These are State tax rates per gallon. In addition there is the Federal tax of one and one half cents (1½c) per gallon.
° Revised.

George W. Cocke, former district manager in Oklahoma for Erie Meter Systems, Inc., has joined Bowser, Inc., as representative in the Tulsa area. He will handle sales of equipment to major companies in that territory and will make his headquarters in Tulsa. Mr. Cocke was with Erie Meter for the last 13 years.

° ° °

Ed T. Landgraff has been appointed a member of the sales staff of Chiksan Co., Brea, Calif. His headquarters will be in New York.

Mr. Landgraff for the past 20 years was connected with Oil Well Engineering Co., the last three as American representative. In addition to sales to the domestic market in the New York territory, he will serve as eastern representative of Chiksan Export Co.

° ° °

Glen R. Wells, district sales manager for Tokheim Oil Tank and Pump Co., returned to Louisville on April 1 from Fort Wayne, which will be his headquarters as before the war. He will have jurisdiction over Indiana and Kentucky, as well as portions of the states of Ohio, Illinois, and West Virginia.

Douglas Hill, formerly of Shell Oil Co.'s Indianapolis division, has been appointed by Mr. Wells as commission representative in 14 counties in central Indiana, including the city of Indianapolis.

° ° °

L. J. Drake has been elected chairman of the board of Union Tank Car Co. after serving as president of the company since 1926. **B. C. Graves** was named president and **J. E. Harley** vice president. **A. E. Gebhardt** and **R. H. Lamberton** were appointed assistants to the president.

CLASSIFIED

For Sale

FOR SALE: 4000 gal. Standard Steel, two compartment truck tank with 1942 Ford CCE tractor with two speed axle; A-1 rubber, good running condition. $3000. Box 957, Columbia, S. C., Phone 8381.

FOR SALE 1—4 3/4" x 8" National Transit Hot Oil Vertical Triplex Pump, Complete less driver. Pumps 120 G. P. M. at discharge pressure of 1,000 lbs. per square inch. Used only two weeks. Purchaser to remove from foundation in building, Velsicol Corporation, Marshall, Illinois.

TANK TRUCK

1265 gal. G.M.C. Streamlined Tank Truck with printing meter. Price $1200.-00.

SWETT BROS.
HEATING & APPLIANCE CO.
559 State Street Springfield 9, Mass.

FOOT VALVES

Immediate delivery on 1-1/2" double-poppet all bronze. Write for prices

INDEPENDENT PUMP COMPANY
535 Ottawa Street Muskegon, Michigan

TRAILER

One Fruehauf, 2480 gallon, 2-compartment, semi-trailer. 1-compartment 1390 gallons, 1-compartment 1090 gallons. In good condition, being used regularly. Reason for selling, buying larger equipment.

CENTRAL OIL COMPANY
GLASGOW, KENTUCKY

ALWAYS GET ISP's QUOTATIONS TOO!
USED TANK CAR TANKS
For Liquid Storage
6000 to 10,000 gallons
HEAVIER SAFER CHEAPER
CLEANED TESTED
PAINTED
Also, Vertical Tanks of All Capacities
IRON & STEEL PRODUCTS, INC.
41 years' experience
13456-A S. Brainard Avenue
Chicago 33, Illinois
"*ANYTHING containing IRON or STEEL*"

NEW 3250 GAL. TANK TRAILERS
IMMEDIATE DELIVERY

Streamlined, fully skirted, open wheel pockets, 3250 gallon tank trailer with 4 compartments. Two full size enclosed barrel cabinets on each side of tank. Right rear cabinet houses manifold and meter—air brakes—17,000 lb. Timken axle—tires 10:00x20, brake size 16½" x 6" x ¾". Emergency valves with controls—2" outlet lines—2" manifold.

WILCO, INC.

300 Madison Ave. Memphis, Tenn.
Phone 5-8166

Professional Service

MAKE PETROLEUM EXPLORATION BY RADIESTHESY
Making radiesthesist exploration before drilling you know quickly if there is oil or not.
No More Dry Holes
First Test Gratis
Write
FAURE, 35 EAST 60 ST.
NEW YORK 22

Wanted to Buy

WANTED: Trailer-tank or complete unit approximately 2,000 gallons, 4 or 5 compartments, in good usable condition. P. O. Box 538, Warren, Pa.

STEEL TANKS

5,000 to 20,000 gallons. Must be in good condition.

EMPIRE EQUIPMENT CORPORATION
608 Empire Bldg. Cleveland 14, Ohio
Phone Main 7667

WANTED

Wanted to buy skimming plant or small refinery. Give complete information.

BOX 24

Business Opportunities

FOR SALE

Wholesale Oil and Gasoline Franchise with Major covering ten towns in Piedmont, N. C. or would sell half interest to experienced oil man. Poor health reason for selling. Proposition will stand rigid investigation.

BOX 25

TO MANUFACTURERS OF
OIL MARKETING EQUIPMENT AND
SERVICE STATION ACCESSORIES

An established, energetic manufacturers representative, capable of engineering equipment installations—and at the same time experienced in merchandising supplies and accessories sold to or through service stations and bulk plants—is interested in representing one or more progressive manufacturers along the Eastern Seaboard.

We offer high-grade engineering sales talent capable of quickly and profitably establishing distribution of equipment for bulk plants, service stations, etc.

We can guarantee overnight distribution of lubricating oils and greases and certain types of automotive accessories and service station supplies in much of the territory.

Twenty-five years of selling, sales direction, and management have developed our ability to serve you to a point that will impress you. Write Box 26.

Positions Wanted

OPERATING SUPERINTENDENT, 20 years major oil company experience in operating and maintenance of water terminals, bulk plants and service stations. Now employed. Can locate anywhere. Box 27.

EX ARMY OFFICER with 18 years experience in Oil Industry, wholesale and retail distribution, desires to purchase small jobbing business or will invest in going business where a position is offered. Will also consider commission agency or sales position. Willing to go any place in U.S.A. or foreign countries. Box 21.

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Welcome Back . . . . . .

William H. Strang has been appointed executive secretary of the Petroleum Division, American Institute of Mining and Metallurgical Engineers, Inc., succeeding **Chester Naramore,** who resigned last June.

Mr. Strang

Mr. Strang has recently returned to inactive duty with the rank of lieutenant colonel after more than four years service with the Army Ordnance Department in the United States, England and Europe. A native of Denver, Colo., he attended Colorado School of Mines and was graduated from University of Oklahoma. Before the war he held an engineering position with Continental Oil Co. at Ponca City, Okla., and served as Gulf Coast district editor of *The Oil Weekly.*

Separate offices for the Petroleum Division of AIMME will be established at Dallas, and a broad program is planned to expand the activities of the division and assist the regional sections in the oil producing areas throughout the country, **Herbert F. Beardmore,** division chairman, said.

° ° °

Lt. Col. Charles M. Sherfesee, after serving in the Army in the United States, Mediterranean and European theaters of operations, has returned to Humble Oil and Refining Co. as a civil engineer in the East Texas Division.

Maj. J. M. Spiller, located in the Louisiana Division before entering the Army, has returned to Humble as a district civil engineer in the East Texas Division.

Lt. Col. John S. Toler, after serving with the Army in Europe, Africa and the Middle East, has returned to Humble as district civil engineer in the Louisiana Division.

Lt. Col. Wyatt G. Trainer, after nearly six years of service with the Army in the United States, the European Theater of operations and the Philippine Islands, has returned to Humble as civil engineer in the Southwest Texas Division.

Maj. Lloyd O. Zapp, civil engineer in the Gulf Coast Division before going into the Army to serve in the United States, North Africa and Italy, has returned to Humble as a supervising engineer in Houston.

° ° °

Walter H. "Tex" Ritterbusch, Jr., recently discharged from the Air Corps after three years service as an aircraft engineering officer, has joined S. M. Jones Co.

Mr. Ritterbusch is the latest member of the field engineering staff organized by Jones to analyze wells, record sucker rod service and confer and co-operate with production engineers to improve pumping conditions.

With a B. S. in petroleum production engineering received at the University of Tulsa—he has also had practical field experience on seismograph crews and roust-a-bouting for various oil companies.

° ° °

Charles R. Barr, recently released from military service, is a new geological scout for the Stanolind Oil and Gas Co. at Midland, Tex.

° ° °

Lt. Col. R. D. Wrigley, Jr., who during the war was with the Air Force Petroleum Supply Section particularly during all of the fighting in France and Belgium and Germany, is out of the Army and located at Cape Town, South Africa, with the California-Texas Oil Co. Ltd. It was from that post that Col. Wrigley enlisted with the Air Force at the start of the war. Prior to that he had been in The Texas Co.'s service in Belgium and other points in the world.

° ° °

Chief Warrant Officer Norman E. Minter, USNR, has returned to his oil business in Danville, Va., after a 27 months' tour of duty in the Navy. He spent 19 months in the South Pacific as Assistant Fuel Officer and Officer in Charge of the Naval Fuel Annex at Manus in the Admiralty Islands.

Upon his return to the states, Mr. Minter was ordered to Washington, D. C., for duty as head of the Lubricating Oil Section, Fuel Division, Bureau of Supplies and Accounts. He handled procurement and distribution of lube oils to continental Naval activities.

° ° °

Capt. Warren D. Sorrells, in the Army-Navy Petroleum Board's Distribution Section the last year, was relieved of active duty May 1 and is joining Bennett & Sorrells, drillers and producers, at Fort Worth as chief engineer. He recently was awarded the Army Commendation Ribbon for his services to the board. Before the war, Capt. Sorrells was with Creole Petroleum Corp. in Venezuela about seven years. He entered the Army in August, 1943, from PAW's Foreign Division, was in the Technical and Planning Branch of the Fuels and Lubricants Division, OQMG, about a year and served another year in California in a Corps of Engineers petroleum development and rehabilitation unit.

° ° °

Charles P. Baker, formerly employed as technical adviser to the operating department of Beaumont Refinery of Magnolia Petroleum Co. prior to entering the armed services, on Jan. 1, 1946 joined the Lubrite Division of Socony-Vacuum Oil Co., Inc., as assistant to **W. H. Montgomery,** East St. Louis refinery manager. March 1 Mr. Baker was promoted to the position of general superintendent of the East St. Louis plant.

After graduation from Texas A. & M. Mr. Baker joined Magnolia. During his employment with Magnolia he was loaned to Houdry Process Corp. for work in their development laboratories at Marcus Hook, Pa., and later to Socony-Vacuum's Research and development laboratories at Paulsboro, N. J.

Mr. Baker entered the Army as second lieutenant in July, 1942. His services were requested later by PAW and advancing to the rank of major, he became chief of PAW Aviation Section.

° ° °

Cmdr. Neil MacCoull, USNR (retired), has returned to Beacon Laboratories of The Texas Co. as consulting engineer after a military leave of absence of nearly three years. This is the second time Cmdr. MacCoull has returned to Texaco after military service, the first time being 27 years ago after service with the Naval Air Forces in France.

Cmdr. MacCoull has had experience with airships in the Naval Reserve since 1928 and on training duty flew in the airships U. S. S. Los Angeles, Akron and Macon. In World War II he was assigned to the Naval Air Station at Lakehurst, N. J., as airship power plant engineer. He also held various appointments such as assistant experimental officer and laboratories division officer in charge of the chemical, physical and engine experimental laboratories.

March 1 the commander completed 27 years of service with The Texas Co.

Contributions Welcomed!

NPN welcomes contributions from readers for the Welcome Back page.

If you have a friend or an employe who has returned to an oil company after service in the armed forces, send information, including his, (or her) name, address, rank, places and type of service, decorations, civilian position to:

Welcome Back Editor
National Petroleum News
1213 West 3rd Street
Cleveland 13, Ohio

ABOUT OIL PEOPLE

C. A. (Doc) Jordan, who for years was manager of sales for Shell Oil in Cleveland, has recently been made manager of sales for Shell in California. He was transferred to San Francisco two years ago and has since been promoted to be in charge of all sales with headquarters at San Francisco. "Doc", who never was any too well equipped with flesh on his bones, looks cheerier and happier and a bit heavier than when he was in the ice and hot climate of Cleveland.

° ° °

E. G. Richardson, for many years vice president for the International Lubricant Co., has just returned from a hurried and lengthy trip all around Africa by plane. He made the complete circumference of the country making a dozen or more stops and of course, looking for lubrication business which he says he found or expects to develop as the result of his trip.

° ° °

Richard W. Reinhart, formerly assistant in charge of Socony-Vacuum Oil Co. Inc. eastern marketing division's sales research department, has been made manager of the company's national market research department. He has been with the company for the past 19 years, starting in 1927 as a service station operator with Standard Oil of New York in Buffalo.

° ° °

Jessie H. Higgins was appointed April 1 to fill the post of executive secretary, Illinois Petroleum Industries Committee. A vacancy was created by resignation of **H. L. Robinson,** who held the position since October, 1943.

Since 1941 Mr. Higgins has been a member of the state legislature as representative from his home in Oblong and also served on House Oil and Gas Committee. He was also a scout for Pure Oil Co. in the Illinois basin for the past four years, resigning to accept his new post.

For 11 years prior to 1941 he owned and operated a shoe store in Oblong.

° ° °

E. A. McCulloch will be manager of the Sunray Oil Corp.'s new West Texas-New Mexico geological and land department in Midland, Tex. The office is a new one for Sunray.

Honored by New England Independent Jobbers

Louis A. Myers (left) retired division manager of Socony-Vacuum Oil Co., Inc., and John A. Maddocks, retired division manager of Gulf Oil Corp., were snapped by the NPN photographer at Boston shortly after Clyde G. Morrill, executive director of Independent Oil Men's Assn. of New England, had presented them with life membership in the organization

COMING MEETINGS

MAY

National Association of Corrosion Engineers, President Hotel, Kansas City, May 7, 8, and 9.

National Retail Credit Assn., including Petroleum Group, Statler Hotel, Cleveland, May 13-16.

Virginia Oil Jobbers Assn., spring convention, Jefferson Hotel, Richmond, Va., May 16.

Virginia Oil Men's Assn., spring convention, Jefferson Hotel, Richmond, Va., May 17.

National Oil Scouts & Landsmen's Assn., Hotel Heidelberg, Jackson, Miss., May 23-25.

American Petroleum Institute, Production Division, Shreveport, La., Washington - Youree Hotel, May 17-18.

JUNE

Society of Automotive Engineers, Summer (Semi-Annual) Meeting, Hotel French Lick Springs, French Lick, Ind., June 2-7.

Florida Petroleum Marketers Assn., Riviera Hotel, Daytona Beach, Fla., June 5.

American Petroleum Institute, Production Division, Skirvin Hotel, Oklahoma City, June 6-7.

American Petroleum Institute, Production Division, spring meeting, William Penn Hotel, Pittsburgh, Pa., June 13-14.

Oil Heat Institute of New England, annual exposition, Hotel Statler, Boston, June 24-27.

Pennsylvania Grade Crude Oil Assn., annual meeting, William Penn Hotel, Pittsburgh, June 27-28.

AUGUST

Society of Automotive Engineers, West Coast Transportation & Maintenance meeting, Hotel New Washington, Seattle, Wash., Aug. 22-24.

SEPTEMBER

Chicago Section, American Chemical Society, Coliseum, Chicago, Sept. 10-14.

Society of Automotive Engineers, Tractor Meeting, Hotel Schroeder, Milwaukee, Wis., Sept. 11-12.

National Petroleum Assn., 44th annual meeting, Hotel Traymore, Atlantic City, N. J., Sept. 18-20.

Indiana Independent Petroleum Assn., fall convention, Hotel Severin, Indianapolis, Sept. 26-27.

National Lubricating Grease Institute, 14th annual meeting, Edgewater Beach Hotel, Chicago, Sept. 29-Oct. 2.

OCTOBER

Society of Automotive Engineers, Aeronautic (Autumn) & Aircraft Engineering Display, Hotel Biltmore, Los Angeles, Oct. 3-5.

Society of Automotive Engineers, Transportation and Maintenance Meeting, Hotel Knickerbocker, Chicago, Oct. 16-17.

NOVEMBER

Petroleum Division, National Assn. of Credit Men, annual convention, William Penn Hotel, Pittsburgh, Nov. 5-6.

DECEMBER

Society of Automotive Engineers, Air Transport Engineering Meeting, Edgewater Beach Hotel, Chicago, Dec. 2-4.

MARCH, 1947

Indiana Independent Petroleum Assn., spring meeting, Hotel Severin, Indianapolis, March 13-14, 1947.

AER-O-FOAM *Put this Fire Out*

6800 sq. ft. of blazing light crude oil after burning 23 minutes.

Two minutes after Aer-O-Foam was started.

Three minutes later.

THE AER-O-FOAM BLANKET THAT DID IT

Only 375 gallons of Aer-O-Foam liquid were used to extinguish this fire in a 93 foot diameter tank, containing Illinois crude oil to a height of 19 ft. The fire was completely extinguished in a few minutes by applying Aer-O-Foam at the rate of .66 gallons per sq. ft. of oil surface per minute. Aer-O-Foam was applied at two points through National Type "L" Foam Chambers with Moeller Tubes.

Aer-O-Foam, developed by National Foam System, smothers fire with a thick, tough, enduring blanket. Tagged "Bean Soup" by the Navy, Aer-O-Foam does for peacetime industry the same superb job it did in war. It sticks to insulate flame-threatened flat or upright areas—it flows equally well to smother the hottest fires in petroleum, chemical, aviation and other industries.

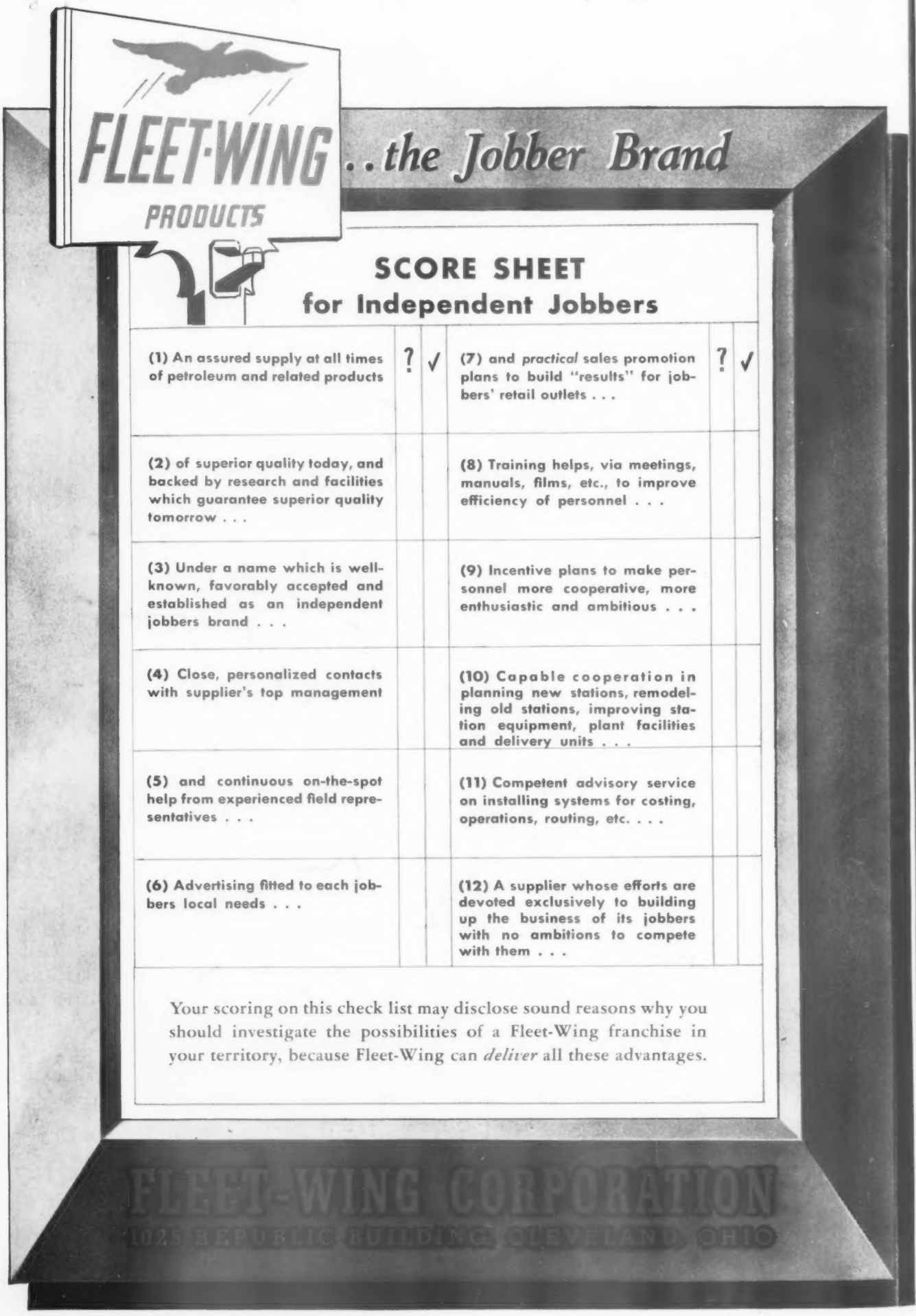
National Foam, as powder or Aer-O-Foam liquid, fits every industry's post-war budget. Ounces of fire prevention save many million pounds in plants and materials. Foam's gas-tight blanket quickly extinguishes fires, prevents them from spreading, permits no flashbacks.

Don't wait for fire to cancel your peacetime expansion. Wire, telephone or write today to safeguard your progress. Our engineers are yours.

NATIONAL FOAM SYSTEM, INC.

SPECIALIZING IN FOAM FIRE PROTECTION

Packard Building, Philadelphia 2, Pa.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PRODUCTS
..the Jobber Brand
SCORE SHEET
for Independent Jobbers
(1) An assured supply at all times of petroleum and related products
? ✓
(2) of superior quality today, and backed by research and facilities which guarantee superior quality tomorrow . . .
(3) Under a name which is well-known, favorably accepted and established as an independent jobbers brand . . .
(4) Close, personalized contacts with supplier's top management
(5) and continuous on-the-spot help from experienced field representatives . . .
(6) Advertising fitted to each jobbers local needs . . .
(7) and *practical* sales promotion plans to build "results" for jobbers' retail outlets . . .
? ✓
(8) Training helps, via meetings, manuals, films, etc., to improve efficiency of personnel . . .
(9) Incentive plans to make personnel more cooperative, more enthusiastic and ambitious . . .
(10) Capable cooperation in planning new stations, remodeling old stations, improving station equipment, plant facilities and delivery units . . .
(11) Competent advisory service on installing systems for costing, operations, routing, etc. . . .
(12) A supplier whose efforts are devoted exclusively to building up the business of its jobbers with no ambitions to compete with them . . .
Your scoring on this check list may disclose sound reasons why you should investigate the possibilities of a Fleet-Wing franchise in your territory, because Fleet-Wing can *deliver* all these advantages.
FLEET-WING CORPORATION
1025 REPUBLIC BUILDING CLEVELAND OHIO

TECHNOLOGY DEPARTMENT

NATIONAL PETROLEUM NEWS

Monthly Technical Section Devoted to

REFINERY MANAGEMENT and PETROLEUM CHEMICAL TECHNOLOGY

Section Two | May 1, 1946 | Vol. 38, No. 18

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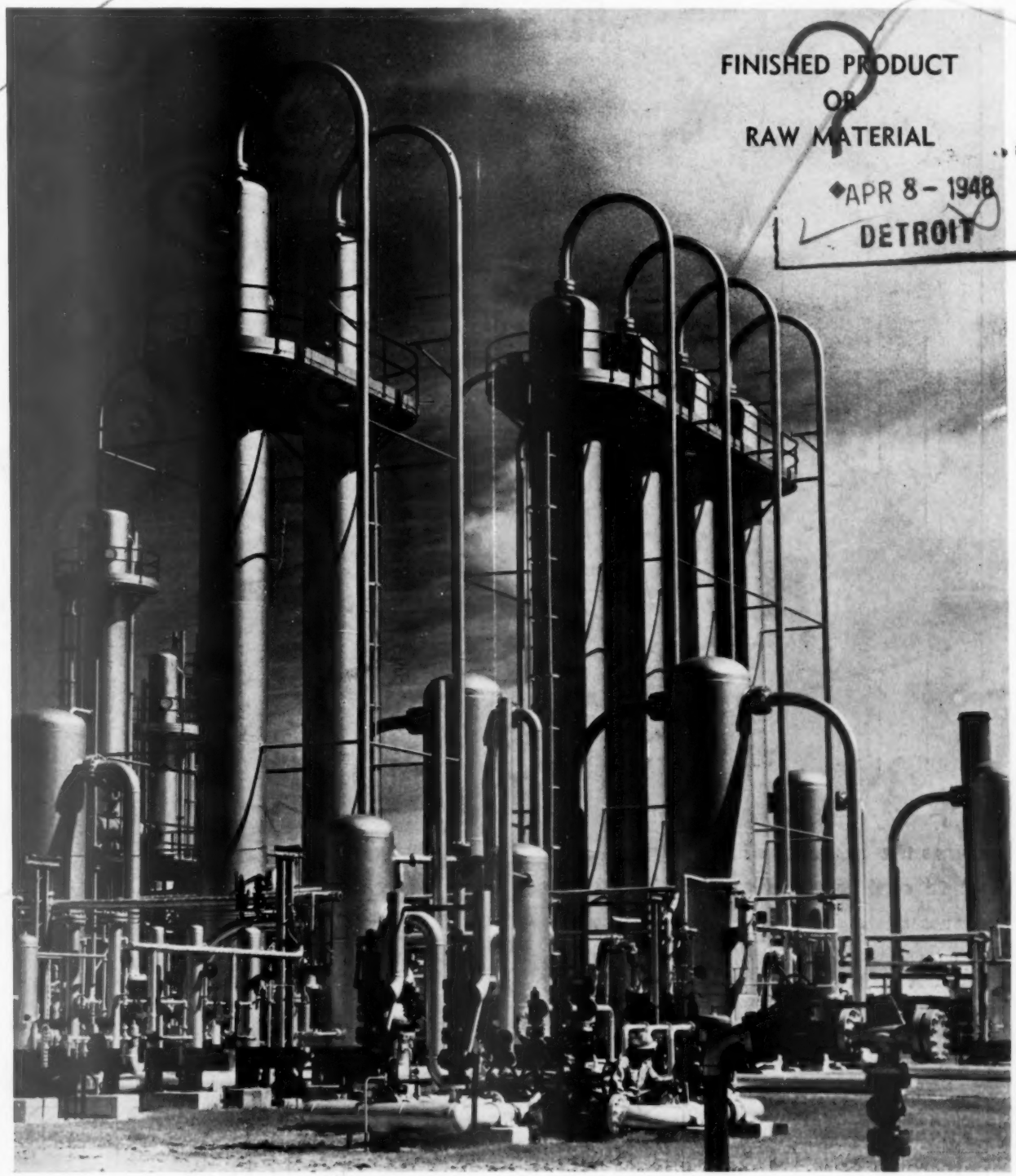
CHEMICAL RESEARCH LABORATORY
1600 WEST EIGHT MILE ROAD
DETROIT, MICH.

FINISHED PRODUCT
OR
RAW MATERIAL
?
APR 8 - 1948
DETROIT



Future economic disposition of liquid products of natural gasoline and cycling plants, whether as motor fuel and other finished products or as materials for further refinery processing, is a mounting industry question. (See N.G.A.A. report, R-380, and editorial, R-400).

Typical of modern cycling is the Katy Gas Cycling plant (Humble) at Katy, Texas, shown above. The four absorbers strip natural gas at 1800 psi. of material recovered as liquid products. The two towers in the foreground supply residue gas to sales systems at 800 psi.

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HUDSON COOLING TOWERS

MECHANICAL AND NATURAL DRAFT

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"Bring Output of Natural Gasoline and Cycling Plants into the Total Supply and Demand Picture"

★—*EXCLUSIVE* in the NPN Technical Section

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PREVIEW

OF JUNE FEATURES

Technical Service Groups For Small Refiners

Many of the large oil companies have proved the worth of Technical Service Divisions as a practical means of liaison between the professional research and developments staffs and the plant operating departments. They serve as trouble-shooters on the new type processing units; design and engineer new units; eliminate operating bottlenecks; run performance and acceptance tests, among other duties.

The organization and functioning of these groups in several refineries have been studied by staff writers of the NPN Technical Section, for the purpose of showing how this successful feature of the organization of a refinery plant can be used by the smaller companies.

Next issue's special staff feature.

Fast Methods of Analysis Of Additive Lubricants

Widespread use of many types of additives in lubricating oils often burdens the control laboratories when conventional methods are used to analyze the additive materials and the additive lubricants.

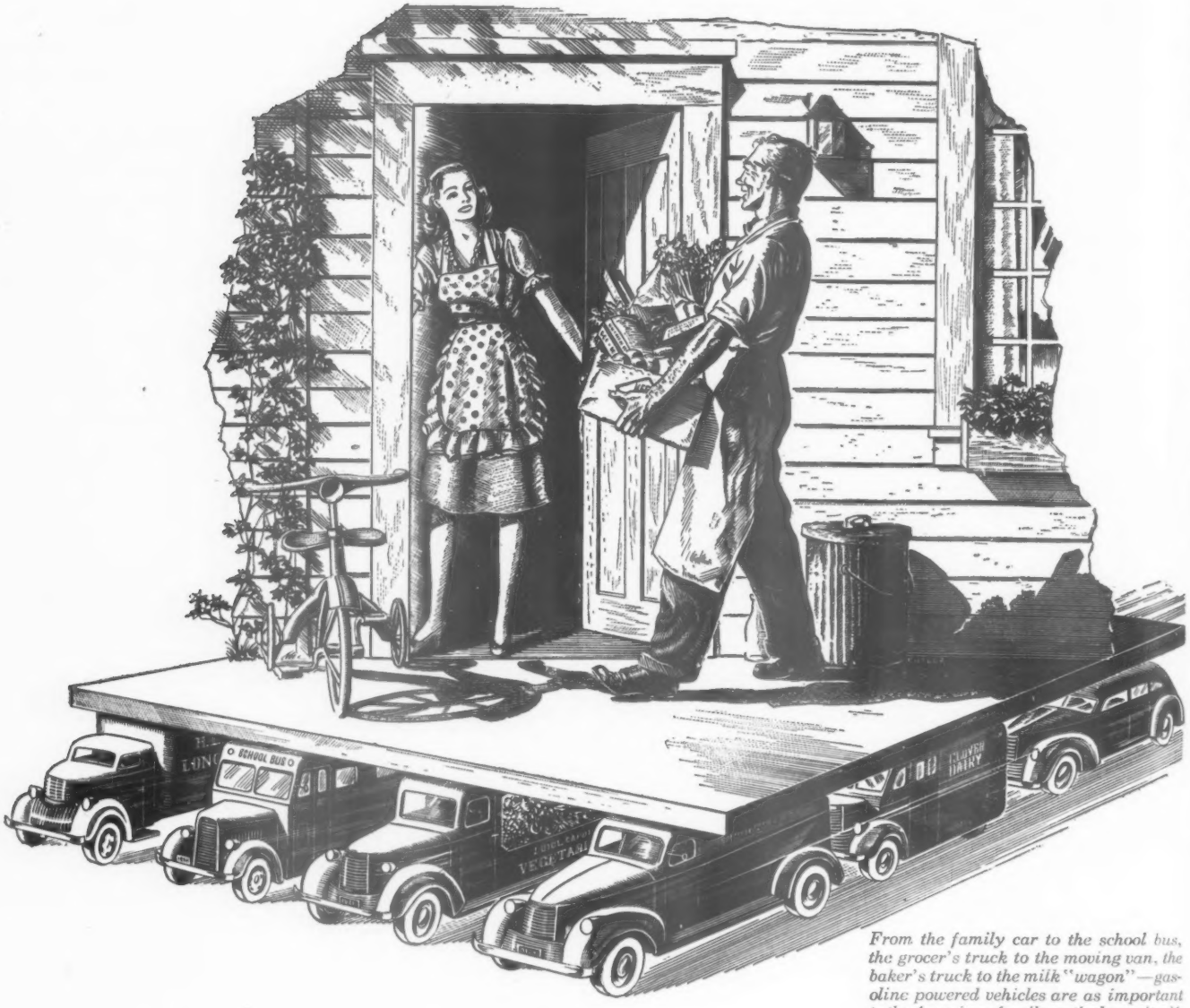
With the intention of increasing speed in this work, while maintaining accuracy to a high degree, the chemists' staff for a large industrial consumer has developed new faster methods of chemical analysis. They also developed a spectrographic technique for quantitative analysis, by means of which accurate tests can be conducted in a few moments as compared with 12 to 16 hours by conventional chemical analysis. This spectrographic method has also been applied to determine the percentage of TEL in gasoline.

Both methods are described and test results given in an exclusive article appearing in the June issue.

Postwar Utilization Of Hydroforming

Hydroforming, a catalytic process for upgrading naphthas by means of dehydrogenation and cyclization, was used during the war to produce toluene and aviation gasoline blending components, hence but little information on its operation was available.

Since V-J Day, however, hydroformer units have been shifted to their original function of converting low-octane naphthas into stable, high-octane, sulphur-free gasoline for use as motor fuel. In an exclusive article, data from post-war runs at various plants are presented and commercial results currently being obtained are discussed.



From the family car to the school bus, the grocer's truck to the moving van, the baker's truck to the milk "wagon"—gasoline powered vehicles are as important to the American family as the home itself.

American homes run on gasoline

MOTOR TRANSPORTATION is so closely woven into the pattern of American living that every man, woman and child benefits when its cost is reduced.

For many years, Ethyl antiknock fluid, used by refiners to improve gasoline, has been of considerable help in the big, overall job of providing the nation with more economical transportation. That is because improvements in the power and efficiency of engines have depended to a large extent upon higher antiknock gasolines.

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REFINERY MANAGEMENT *and* PETROLEUM CHEMICAL TECHNOLOGY

May 1, 1946
Volume 38
Number 18

MONTHLY TECHNICAL SECTION OF NATIONAL PETROLEUM NEWS *incorporating International Petroleum Technology*

REFINERY TRAINING COURSES

Teaching Plant Men New Techniques In the Mechanical Crafts

Postwar Training Program of Standard Oil (N. J.) Is Designed to Bring Workers in Mechanical Departments Up-to-Date On Improved Methods Developed in Their Crafts During the War

THE training and upgrading of its refinery personnel is one of the major features of the postwar planning of the Standard Oil Co. of New Jersey. This company operates refineries at Bayonne, Bayway, Baltimore, and the Colonial Beacon Oil Co. refinery at Boston, in the north; and Charleston, S. C., and Baton Rouge, La., in the south.

In addition to the usual objectives of most training programs, one of the purposes of the postwar plan will be to expedite the adoption in refinery operations of improved practices that came out of the war. While the material covered in this article relates specifically to the New Jersey Works operations at Bayway and Bayonne, similar programs modified to meet local needs are anticipated or in effect in the other refineries operated by this company.

Several conditions arising directly from the refineries' wartime experience were considered in shaping the operating program for the postwar competitive era. This company, as did the petroleum refineries generally, followed the practice of running its plants in the wartime period as much as possible with existing staffs. For the most part the men who went into the Armed Forces were not replaced, at least by young men. Thus, the average age of the working forces in the refineries has advanced compared to normal times. In one of the plants, this average age now is 52 and in another 45 years.

This increased age is not considered as a highly important factor in operating or process work where the increase in automatic control features in the new units and the improved processing equipment has lessened the physical demands on process personnel. In addition, operating crews are designed to meet emergency and turnaround conditions, and, therefore, represent ample manpower without undue physical demands during normal operations.

The average age of employes, however, is considered an essential factor in the Mechanical Departments of the refineries, such as Welding, Machine Shop, Sheet Metal Working, Pipe Fitting, etc. Here it is recognized that the factor of advanced age has a more direct bearing on the work done by the individual. By proper planning and placement, together with training, the older employes can be made to be continually effective, relinquishing the jobs requiring higher physical demands and agility to the younger age groups, who in turn must be properly trained for these assignments.

During the war, the mechanical craft employes were confined to the plants under the wartime working schedules more than at normal times and did not have the opportunity to learn the new techniques that the war emergency developed in many of the mechanical crafts. Also, new younger employes who had acquired the new methods and practices in their crafts by vocational training were not brought into the plants during the war.

Another condition which the company had to take into account in setting up its plant operating program for the highly competitive postwar period is the general shortage of technically trained men, such as chemists, engineers, and chemical engineers. The entrance of young men into the armed services instead of into college during the war period has caused a dearth of professional personnel. As has been frequently discussed, this condition will continue for the next few years. Various means have been provided in the New Jersey Standard program to offset this handicap to the highest degree possible.

Another factor which the manufacturing heads of this company know they face in the competitive period that the refineries are now entering is the overall higher level of efficiency in refineries generally. This is due to the exchange of technological data among all plants during the war period. This meant that the plants operating at highest relative efficiency gave much more of their know-how to the less efficient plants to help them bring up the volume of the wartime production. It is felt by this company that refineries generally start the postwar period in a more nearly equal level of operating efficiency than was the case prior to the war.

Another handicap which the Standard of New Jersey plants now face, as well as those of some other companies in the wartime program, stems from the fact that their catalytic cracking, alkylation, and other new major process units were among the first of their kind installed in any plants. In many cases these installations were made almost directly, without the usual expensive pilot plant stage of development. The units in these refineries, therefore, do not incorporate many of the improved features of the models later installed. New units still to be built throughout the industry will be still more advanced. It will be more difficult to maintain high operating efficiency in the earlier units than in recently installed models.

In setting up the postwar training program for its employes, this company took into account the various conditions outlined above.

Excluding the considerations given to any supervisory or executive training, it was decided to place the emphasis at present on an upgrading program for

the men in the Mechanical Departments of the plants. It was felt that a program of this type would accomplish two ends: first, it would give these workers an opportunity to learn the new and improved techniques in their particular craft and; second, it would develop all-around skilled mechanics as against craft specialists.

It is pointed out that in these plants the employes are working under collective bargaining agreements and are represented by a N.L.R.B. certified union. The union representatives appreciate the need for training and upgrading of personnel and generally favor the training programs designed to assist workers in their efforts to advance to higher job classifications. These programs are designed so as to be accommodated within the framework of the wage scale as well as to be effective within a collective bargaining system.

With regard to some of the practical details of the courses to be given in the Bayway refinery of the New Jersey Standard, advantage will be taken of the excellent New Jersey State vocational school facilities. The New Jersey vocational schools, which are recognized to be among the best in the country, come under the general direction of John A. McCarthy, Trenton, Assistant State Director of Education in charge of Vocational Training Courses. The state vocational system places considerable emphasis on upgrading and technician training. The New Jersey state program followed a study in many industries of the type and number of plant jobs requiring vocational-technical training as compared with those requiring four years of college training. For 16 of the principal nation-wide industries it was found that the average ratio of technician jobs to the job requiring a professional engineer was 5.2 to 1. For the petroleum and butadiene plants in Texas the ratio was 5.3 to 1. While the ratio was found to vary considerably with the type of industry, little difference was found between similar plants within an industry. See Table 1.

In arranging for the upgrading courses for the workers in the Mechanical Departments, studies were made by the oil company of the nature and extent of improvements in the mechanical crafts which should be taught. The trade techniques had improved in the wartime period due to the use of new materials, greater use of power machinery, the availability of better tools and to new discoveries in the fields in which the craftsmen were used. For example, under the stimulus of the wartime shipbuilding and other programs, the technique of electric welding developed rapidly and it was learned how to weld various alloy steels. Plastics are among the new materials used in plant equipment, so it is necessary for the plant machinists to know how to machine plastics as well as other new materials.

More accurate measurement of heat is available through modern types of pyrometers and knowledge of the use of these instruments is required in some trades as well as knowledge of new improved means for measuring strength of materials. The greater use of instruments has created a new field of work for electricians and instrument repairmen in the maintenance and repair of control instruments. The technical electrician in industry must also be familiar with the theory of operation and maintenance and repair of electronic tubes as used in electronically controlled electric circuits. Great advances have been made in safety devices and safe working methods in plants and it is desirable that any training program include safety training.

In setting up the training courses in the Standard of New Jersey plants, the first step was to make a survey of the plant jobs in the mechanical crafts, to see where further training was required. These needs were rated as to their importance in improving operating efficiency in the plant, so that most emphasis could be given to the training on the jobs with highest priorities. The aims, in the survey, in addition to rating the jobs as to their importance for training needs are: (1) to justify the job training to the plant management; and (2) to obtain the cooperation of the supervisory group affected by conducting a survey with the latter's help.

Points considered in making the job training survey included the age of employes by job classification, their length of service with the company, extent to which they had developed into specialists in certain lines of work within their trade, etc. Foremen were consulted as to what men needed training and great consideration was given their judgment. Specifications were set up for training candidates for workers in the various age groups. In setting up the training courses for the mechanical crafts the work requirements in that craft were studied. For example, for boilermakers, it had to be determined whether it was best to train the second or third class boilermakers to enable them to become first-class workmen, or to further train the first-class boiler-makers.

To provide a goal for the training program, the normal complement of workers in the different classes in each trade was set up, by number of workers, age group and versatility required in their work. After the survey had been made the training program itself was worked out by representatives of the plant training department and the supervisors for the various trades. In the case of a smaller company, the representative of the state vocational-technical training system could be called in to lay out the courses.

In general, the judgment of the foreman will be followed in selecting workers who are to be candidates for training, but the company generally follows the policy of making the courses available to all workers in the department. Experience has shown that the foreman's judgment in selection of trainable people is exceptionally good, and the training course mortality among those who have low native ability in the opinion of the foreman is generally quite high.

The selection of the proper men for instructors of the training courses is an important step in the program. They must not only know the technology of the work but also they must have the ability to instruct others. In the case of a large plant as the Bayway refinery, the instructors for the most part are plant supervisors. If it is more desirable, instructors can be provided by the State Vocational School Bureau, without cost to the company, since the vocational schools are part of the state educational system. The State Vocational System also provides courses which train supervisors and foremen in the art of teaching.

TABLE 1—Ratio of Technician Jobs to Those Requiring Four Years of College Engineering For 16 Industries *

Industry	Ratio of Technicians Per Engineer
Lumbering and Wood Processing (Washington)	20.0
Shipbuilding (Maine)	13.6
Pulp and Paper Manufacturing (Maine)	10.3
Electrical Equipment Manufacturing (Mass.)	10.0
Textile Manufacturing (North Carolina)	9.8
Telegraph and Telephone Communication Service (Ill.)	9.7
Rail Transportation (Alabama and Utah)	9.1
Metal Products Manufacturing (Conn.)	8.0
Iron and Steel Production (Pa.)	6.0
Machine Tool Manufacturing (Conn.)	5.5
Electric Power Production and Distribution (Oregon)	5.3
PETROLEUM and Butadiene Production (Texas)	5.3
Metal Mining (Colorado)	5.2
Automobile Manufacturing (Michigan)	4.2
Industrial Chemistry (Delware and Missouri)	2.2
Hydro-Electric Industry (Tennessee)	2.0
Ratio for all industries	5.2

* From the report "Vocational Technical Training for Industrial Occupations," of the Consulting Committee appointed by the U. S. Commissioner of Education. (1944)

Group of boilermakers watching a safety demonstration in the Baton Rouge refinery of Standard Oil Co. of New Jersey

being conference leaders and in serving more efficiently as personnel representatives of the company.

The vocational upgrading and technician training classes are taught not only through classroom lectures and textbooks, but with demonstrations of the instruments, tools and equipment with which the worker is to be made familiar. If the class consists entirely of men in one plant, classes are likely to be held within the plant. They are held either on company time or the men's time depending on the individual arrangements.

Of equal importance with the training courses themselves in the program of this oil company, is the timing or chronology of the training, as well as the correlation with the basic rates of pay for the worker and his actual work in the plant with respect to the training program. The plants' normal pay structure is based on the existing five classifications in the standard trades of first, second, and third class mechanic, handyman, and helper. From the training survey previously referred to, the needs in each particular trade are determined not only from a training necessity standpoint but also as to the number of individuals needed in each classification as well as the time that such need will exist.

As a result the training is projected to develop people into these classifications as required. For example, the survey may indicate that a definite number of first, second, and third class mechanics will be needed to augment those already in the classifications. These additional requirements represent anticipated depletions due to retirements, deaths, transfers, etc. The sum total then represents not only the type of individuals that is indicated by classifications but also the time that they will be needed.

By this approach, the program is directed so as to provide the anticipated number in each of the classifications at a chronological rate determined by the survey needs. In this way the trade will not be deficient in trained personnel but at the same time will not suffer what might be called "overtrained people". By the latter is meant individuals who are working on one classification but are trained for and are capable of doing work one, two, or three classifications higher. It is generally conceded that the latter situation leads to poor morale.

If the above chronology of training is suitably adhered to, it simplifies the problem of correlating the training work with the basic rate of pay for the worker, since his job advancement in classification will parallel his capabilities to accept the duties and responsibilities of that classification obtained through direct training methods. This approach also assists in administering the complete training program within the framework of seniority. By these means the senior men in each of the classifications can be suitably trained for advancement and, where they cannot be assisted for promotion due to lack of basic ability or they do not choose to take the offered training, there is more justification for their remaining in their present classification where they are capable of fully performing the requirements of the job.

The more formal approach to industrial vocational training as planned, the company hopes, will offset some of the practices which inevitably develop where training is not studied and planned. Under the latter there is a tendency toward job specialization where the workers are used on the type or types of jobs for which they are best suited or for which they can be trained rather quickly. As a result what might be called "trades within a trade" tend to develop.

For example, an individual becomes a "riveter" rather than an all-around boilermaker or an employe becomes a lathe specialist rather than an all-around machinist.

While this trend toward specialization is actually sought in some industries, it is difficult to reconcile in the petroleum industry where the volume of specialized work is not large. The need for all-around trained mechanics far outweighs any gains of specialization. This trend toward specialization leads to job insecurity, in that when there is no work in his special line the worker is laid off or, more often, is transferred to some other work of a lower classification. On the other hand, if the individual's rate is maintained above his capacity to perform the job on which he is placed, the operation or plant is burdened economically with an individual incapable of performing his job duties and responsibilities properly.

With the new training program, as in the past, the aim is to make the worker in the mechanical departments, as well as process and other departments, more than merely a skilled man in his own trade or craft; i.e., to make him a good employe. With regard to the latter, training should be directed so as to develop the many desirable appreciations and worth while attitudes on the part of the workers toward the company, safety, their trades, fellow workers, etc. For example, a welder should appreciate that his failure to report for work may cause the job to be suspended for a maintenance crew of which he is a member. This could be avoided by properly reporting off, in order that suitable plans could be made for his replacement.

The training program for upgrading the workers in the Mechanical department is not the only postwar training the New Jersey Standard has arranged. A course for disabled returning service men has been worked out, prior to which a detalied survey was made of all plant jobs to determine the extent to which work could be done by a man without an arm or a leg, or some other form of physical disability. It was felt that where the job requirements were set up in advance on the basis of a known disability of the worker, and these requirements were known by the foremen, the disabled veteran would be credited with a more satisfactory job performance.

The New Jersey Standard is also resuming its courses for student engineers coming into the plants, which have worked out so satisfactorily in the past in orienting young technical graduates from academic to industrial activities. Such courses had previously been in force for over 20 years.

Tomorrow . . . IN PETROLEUM TECHNOLOGY

Preview of What's Ahead . . . Based on Today's Technological and Economic Developments

Technical and economic topics projected this month for their possible later bearing on petroleum refining operations include:

Analysis of gasoline consumption forecasts.

Production of alcohol from foods has again proved uneconomic.

Houdry Process Corp. announces a new hydrocarbon.

Propane deasphalting of cracking feed stocks.

Increased use of synthetic detergents is seen.

Flood of applications received by the Patent Office.

Ethylene is Aliphatic Synthesis Brick.

Age of Automobiles Portends Troubled Period

The recent settlement of strike problems and the resumption of automobile production has somehow caused the public to feel unduly optimistic about the automobile situation. This optimism has spread to the petroleum industry which, during the war, was soberly aware of the decrease in the car population and the attendant likelihood of a lessening in postwar gasoline demands over those of the immediate prewar period.

One petroleum journal, for example, recently contained an article headlined, "Civilian Gasoline Consumption Seems Headed for New Record," basing this statement, fairly logically (for normal times), on "reports of solidly booked reservations for accommodations throughout the country, record numbers of requests on automobile clubs for routings, and preparations of resorts for more tourists than in 1940." Other reports of growing gasoline consumption are also being accompanied with the statement that war-worn automobiles are standing their increased use far better than was previously expected.

All this is cause enough for some optimism, but the petroleum industry will do well to take another look at car production records before rushing new gasoline plants into production. Such statistics are readily available and have recently been summarized in one of the automotive journals.(1)

For the sake of arriving at some method of interpretation, let us take a glance at what might be expected on Jan. 1, 1949. Assuming that 2,500,000 cars will be produced in 1946(2) and 6,000,000 cars per year in 1947 and 1948; that the present car population contains no cars produced before 1934 (the 1945 car registration was 25,301,345, about the same figure as production from 1934-1945); and that 2,500,000 cars will have to be scrapped each year in 1946, 1947, and 1948—all from the oldest cars in this fictitious group, the car age picture would be somewhat as given in Table 1 below.

TABLE 1—Car Age Picture in U. S.

Model Year	Number Available in 1949	Years of Age
1948	6,000,000	1
1947	6,000,000	2
1946	2,500,000	3
1945	83,793	4
1942	220,814	7
1941	3,744,600	8
1940	3,692,328	9
1939	2,866,796	10
1938	2,000,785	11
1937	3,915,889	12
1936	1,500,000	13
Total	32,500,000	

It will at once be seen that many of the above assumptions are unjustifiably optimistic. For example, it is obvious that the present car population contains many cars produced before 1934, and it is by no means certain that scrapping can be held to the selected figure; even if fewer cars were to be scrapped, incidentally, it is likely that these "junkers" cannot be driven many miles.

At any rate, these figures would indicate a car population for 1949 of about 32,500,000, a satisfactory figure were it not for the age factor indicated. Peak registration of passenger cars, incidentally, was 29,240,417 in 1941.

The joker, of course, is the fact that over half of the available cars will be at least 8 years old, far more than a healthy age for cars which have seen service during the recent war. Only that half of the car population produced in 1942, 1945, 1946, 1947, and 1948 will presumably be of normal utility.

These figures are capable of much refinement, since records of the exact age distribution of present cars are undoubtedly available somewhere. Nevertheless, they definitely indicate two things: (1) car manufacturers may certaintly look forward to several years of intense demand, and (2) petroleum interests must view with caution any predictions of near-future sustained record demands for gasoline. Unfortunately, cars available will be too old and too few to permit such an agreeable situation.

Alcohol from Foods Again Proved Uneconomic

Recent U.N.R.R.A. requests have served again to call attention to the inadvisability of using as chemical raw materials some of the farm products which are also basic foods. Humanity requires us to provide food for the starving before we produce alcoholic beverages for ourselves. However, this same humanity—or rather human nature—must be carefully checked when, in times of superabundance, it tries to force the use of excess farm products as chemical raw materials on the grounds that to do otherwise is to waste our inexpendable resources and to spend more for relief than the subsidy required to make this use economic.

Both of these latter arguments have some validity, or at least require careful consideration. If this were a totalitarian country, it would be logical to use farm surpluses when available, then turn to other sources when they were not. In this country, however, those enterprises which produce finished products forms raw materials must plan, as well as they can, to use substances which are continuously available at not-too-varying prices.

Agriculture products are not in the latter class except, to some extent, those which are inedible. Their availability depends upon the planting whims of the farmer, unless he is employed on a contract basis. Even then, drought, flood, frost, blight, and insects may drastically curtail yields—whereupon prices on a free market will (obligingly for the farmer) take an upward trend. Let a domestic food shortage arise; public

(1) *Automotive and Aviation Industries* 94, No. 6 (1946), "28th Annual Statistical Issue."

(2) Allen, H. A., NATIONAL PETROLEUM NEWS 38, No. 13, 28 (1946), "Passenger Car Output May Total 2,500,000 by End of Year."

and politicians alike rise up in wrath against the idea of using a food for commercial manufacture.

Many commercial chemicals, it is true, are agricultural in nature. Except in Germany, fatty acids, oils and fats, and their chemical derivatives—soaps, drying oils (for paints), etc.—have always been naturally produced. Paper is also a natural product, although its chief raw material, wood, is chemically economic for little else. Countless others can be named; until recently, as we know too well, rubber was made by nature and inadequately and insufficiently imitated by man.

The chemical in question here—alcohol—is the perennial toy of those farm elements who do not care for facts when their granaries are overflowing or their incomes seem too low. It is certainly true that alcohol can be produced from grain in vast quantities; a fortunate fact, or our synthetic rubber program would have been delayed during the war. It is equally certain, however, that butadiene produced from "grain alcohol" will never be able to compete with that produced from petroleum feedstocks—alcohol from hardly any source can be made available at "substantially below 15c per gal., (the price required) to enable it to become competitive with the low-cost petroleum butadiene plants."(3)

Even these farm blocs have a hard time trying to prove that "power alcohol" would be cheaper than gasoline, unless they resort to the subterfuge of comparing manufacturing costs (in surplus times) with the sales price (tax included) for regular gasoline. What would happen to this "alky-gas" when a food shortage threatened again would not be hard to guess.

Where economic, even temporarily, the use of farm surpluses or waste products—especially the latter—should be definitely encouraged, but not by decree. The factors involved are indeed complex, but they cannot be solved by forcing a use which, seemingly advisable one day, can very well prove disastrous the next.

Houdry Process Corp. Announces New Hydrocarbon

According to a recent announcement, the Houdry Process Corp. has recently discovered a new paraffin hydrocarbon having the formula of a hexadecane but with as many carbon atoms in its branches as it has in its main chain. Over 50,000 isomeric hexadecanes are possible, but only a few are known; of these, by far the most familiar is cetane.

The new hydrocarbon, called houdrane in honor of Eugene Houdry, has a number of interesting physical properties. It melts at −108.4°F. in contrast to 64.4°F. for cetane, and it has an atmospheric boiling point of 483.3°F., some 66.2° lower than the boiling point of cetane.

Methods of synthesis and chemical properties will be described at a later date, according to the initial announcement. These will probably make possible some comprehension of the value of this new cetane isomer, since physical properties fail to yield many clues. About all that does seem clear is that this hydrocarbon would probably be a poor Diesel fuel, because of its branched-chain structure. Other uses are therefore indicated.

Propane Deasphalting for Catalytic Cracking Stocks

Propane deasphalting of selected heavy residues has been used for over 10 years as one method for the preparation of quality lubricating oils. Upon its introduction, it attracted much attention, and the versatility of the process has so far caused eight refineries to install processing units.

The literature on this process is most diffuse, well over 100 related U. S. patents having been issued. In essence, liquid propane (or similar "light" liquid hydrocarbons) serves as an anti-solvent in the process, precipitating an asphaltic layer which varies in yield and quality with the charge, propane: residuum ratio, and operating conditions.

The process has recently (1944) been put into use for the removal of asphalt from residuums used for catalytic cracking feed stocks, since the lessened coke laydown per barrel of charge increases the capacity of such continuous catalytic cracking units as the Fluid Catalyst and Thermfor types. Basic details on this adaptation were published in 1944,(4) and additional information is contained in two recent articles.(5)

According to the former source, "since the separation between asphalt and deasphalted oil need not be as sharp as in the case of lube stocks, it is possible to reduce the propane ratio, and thus reduce both the investment and operating costs as compared with the lube stock operation. Propane/feed stock ratios on the order of 4 to 1 give satisfactory results. Tower temperatures vary from 140 to 180°F., depending on the character of the reduced crude."

Space does not permit a description of the interesting details of theory, plant operation, product descriptions, etc; these have been adequately reported elsewhere.(4), (5) Only passing mention can be made, also, of the use of liquid propane treatment for desalting (concurrent with the deasphalting, hence important for preparing certain cracking stocks), deresining (at least one plant currently markets "a variety of exceptionally high viscosity oils or 'resins' for which a ready market has been found(5)," dewaxing, separation, etc.

Other light hydrocarbons can be used, but propane has proved to have certain commercial advantages, at least for lube stock treatment, and present plants have been designed for its use. The term "propane decarbonizing" has recently been employed for the process when used to prepare feed stocks for catalytic cracking units, incidentally.

Propane itself is an inexpensive treating agent, and the deasphalting process is not expensive. A recent economic analysis(5) indicates that, for preparing residuums for use as catalytic cracking feeds, propane deasphalting has marked advantages over vacuum distillation and is more than "highly competitive" with delayed coking even in areas where there is a market for coke.

It is likely that additional propane deasphalting plants will be erected in the near future, both for lube oil and catalytic cracking feed stock treatment. The process, as mentioned, is a versatile one and may even be employed, someday, for the deasphalting of heavy residues to prepare stocks suitable for destructive hydrogenation.(6)

Synthetic Detergents Headed for Increased Use

As predicted in a previous article(7)—an easy prediction, in view of their merits—synthetic detergents are currently "scheduled for tremendous expansion within the next few years."(8) According to the latter source,(8) plant expansions planned by five chemical producers will give the industry a capacity of over 350,000,000 pounds per year.

These "soapless soaps" will be widely marketed in the form of flakes,

(3) Anon., NATIONAL PETROLEUM NEWS 38, No. 12, 57 (1946), "Recommends Exclusive Use of Petroleum Feedstock Plants for Synthetic Rubber."

(4) Dimmig, H. and Dickinson, N. L., NATIONAL PETROLEUM NEWS, *Technical Section*, 36, No. 40, R-686 (1944), "Propane Deasphalting of 'Cat Cracker' Feed Stocks."

(5) Kraemer, C. W., *Oil and Gas Journal* 44, No. 47, 228 (1946), "Propane Deasphalting Process"; Dickinson, J. T. and Adams, N. R., *Ibid.* 44, No. 47, 185 (1946), "Lubricant Stocks Improved by Propane Deasphalting."

(6) Wilson, R. E., U. S. 2,096,949, October 26, 1937 (to Standard Oil Co. [Ind.]), "Refining Pressure Tar."

(7) Anon., NATIONAL PETROLEUM NEWS, *Technical Section*, 36, No. 49, R-881 (1944), "Keeping Up With the News—Petroleum Soaps."

(8) Anon., *Chemical Industries* 58, No. 3, 498 (1946), "Market Outlook—Synthetic Detergents Loom as Major Industry."

powders, and liquids, and their increased appearance will be accompanied with a fanfare of publicity. The editor of the journal whose report we quote,[8] however, "trembles in sympathy with the manufacturers of the new soapless detergents who have the job on their hands of indoctrinating the American housewife with the belief that suds are worthless after all." He obligingly offers license free, the use of the following jingle:

"Skimpy Suds, Skimpy Suds,
No useless foam with Skimpy Suds."

Fortunately, not all manufacturers of synthetic detergents will have to resort to such extremes, as bubble baths attest. Industry as well as the public will use increasing quantities of these "surface-active" agents, and manufacturers are said to anticipate a sales volume of 15% of that of soap within the next few years—a $60,000,000 business, sizeable indeed for the chemical industry.

Petroleum raw materials have found extensive use in the manufacture of inexpensive detergents. It is interesting to note, in a recent report[9], that the "sulfonated paraffinic petroleum compounds and salts" used as surface-active agents in 1943 had a unit price of only 9c per pound, compared with prices ranging from 18 to 65c per pound for other acyclic agents. Similarly, the "sulfonated alkyl aryl compounds" averaged only 19c per pound in that year; the well-known "Nacconols," produced from a kerosene cut, fall into this class.

It might be pertinent, also, to note that German developments indicate that the Synthine process is a prolific source of long, straight-chained hydrocarbons, excellent raw materials for synthetic detergents and soap itself; much soap was so produced. Since natural gas will be used for Synthine production in this country, at least at first, this method constitutes another link between petroleum products and synthetic detergents production.

According to the first-mentioned source,[8] "the new detergents are not expected to replace soap, or reduce soap sales"; a large supplemental market is expected instead. There is no doubt that the soap industry hopes that this is so, but many are taking no chances and are entering the field themselves; some were pioneers. In any case, an increased chemical demand for petroleum hydrocarbons is certainly indicated here.

(9) Anon., *Synthetic Organic Chemicals, U. S. Production and Sales*, 1941-43, U. S. Tariff Commission Report No. 153, Second Series, Superintendent of Documents (Washington), 1946.

(10) McBride, R. S. Hogate, D. D., and Hightower, J. V., *Chemical & Metallurgical Engineering* 53, No. 3, 86 (1946), "Watching Washington—Patents at Flood Tide."

Increased Flood of Patent Applications Received

According to a recent statement,[10] the Patent Office in Washington is currently receiving patent applications at a monthly rate of some 9000, a new record. Even this figure is expected to be exceeded, since the Patent Office believes that the "unparalleled magnitudes of the inventive effort that developed during the war" will cause applications to rise to a rate of 10,000 per month by the end of next year. A continued high level is expected for the next several years.

Patent Office procedure, despite this flood, is being streamlined in an effort to cut the average prosecution time for a patent to 12 months or less. The staff of examiners is being increased, and a program has been instituted by which these examiners will periodically "get out into the field so that they can become more closely acquainted with those industries and activities with which they are concerned." All this is very necessary, since the Patent Office in recent years has only been able to process about 60,000 applications annually.

In a recent press conference, Caspar Ooms, the Commissioner of Patents, has issued a plea to patent attorneys to use simple language and claim constructions in their applications. He decries the long-evident trend toward use of highly-involved legal terms, nondescriptive titles, and a multiplicity of claims of varying breadth. In regard to the latter point, he declares that recent court decisions have clearly indicated that the theory of equivalents makes it unnecessary to claim every imaginable permutation and combination of a process.

It is wise for the patent-conscious petroleum industry to keep a close watch on patent developments. Too many people are imbued with the curious idea that patents are nothing but tools of evil monopolies and must therefore be made available for general use, without regard to source. Far on the other side of the fence are those who decry any attempt to alter existing regulations, even where these admittedly offer opportunity for abuse.

If the original purpose of patent legislation is to continue to be achieved, it will be necessary to combat vigorously those who would, in effect, either rob individuals or companies of the first fruits of their inventive efforts or cause them to try to keep these achievements secret, thus depriving the public of their eventual ownership. It will also be necessary, however, to deprive these demagogues of even their small ammunition by supporting such legislation as that calling for a 20-year life of a patent from the date of application (instead of 17 years from the date of issuance) and such logical pleas as those recently made by Commissioner Ooms.

Ethylene Recognized As Fundamental Aliphatic Synthesis 'Brick'

It is interesting to note, incidentally, that coal interests both here and abroad are well aware of the value of ethylene as a chemical intermediate; Wilson[11], for example, mentions that "the ethylene in coke oven gas, on the basis of 2.5% by volume of the gas and assuming a value of 1.5c per lb., is worth about 30c per ton of coal if completely recovered."

A recent English paper[12] goes into some detail on methods of separation from coal gases but mentions that all of these require much research. Other sources mentioned are ethyl alcohol and—by far the most important at present—petroleum gases, either by separation from cracked gases or preparation from them by pyrolysis. Incidentally, the Germans, hard pressed by wartime necessities, prepared considerable quantities of ethylene by the hydrogenation of expensive, coke-derived acetylene.

As Bridgewater's four tables show, "no other starting material for industrial chemical synthesis enables so many substances to be built up from it." At least 50 commercial chemicals are mentioned, and many more ethylene derivatives exist.

The petroleum industry is well aware that ethylene is "at present by far the most extensively used of all the petroleum raw materials (for chemicals production)."[43] Bulk intermediates produced include ethylene oxide, ethylene chlorohydrin, acetaldehyde, ethylbenzene, etc., while volume chemicals include ethyl alcohol, ethylene glycol and the many other glycol and glycol derivatives, acrylic resins, acrylonitrile, polyethylene resins, neohexane, styrene (for Buna-S and polystyrene resins), ethyl chloride (for tetraethyllead production), and polyvinylidene chloride (Saran).

(11) Wilson, P. J., Jr., *Trends in Coal Chemical Research*, Paper Presented Before the Blast Furnace and Coke Association of the Chicago District, February 5, 1946.

(12) Bridgewater, R. M., *Petroleum* 8, No. 11, 209 (1945), "Ethylene—A Raw Material for the Chemical Industry."

(13) Weil, B. H., *Chemical & Metallurgical Engineering* 52, No. 12, 121 (1945), "Chem. & Met. Report on Petroleum Byproducts, A Big Factor in Organic Chemical Industry."

ONE BOSS FOR THE INSTRUMENTS

By D. P. Thornton, Jr.
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Special Division at Baytown Plant of Humble Handles Their Installation, Maintenance and Repair, Even in the Laboratories; Builds Apparatus in Its Own Shop When Commercial Types are Not Available

THE THOUSANDS of instruments of all types in use at the Baytown, Texas, refinery of Humble Oil & Refining Co. range from the simplest industrial thermometers to the most complicated electronic recorder-controllers. All of them, regardless of type, are installed, maintained, repaired and rebuilt when necessary by the company's own Instrument Department.

In addition to its regular work, the Instrument Department also designs, builds and installs special instrumentation. They recently provided, for example, small differential-flow nozzles for continuous chemical injection of treating fluids for boiler feedwater, liquid level indicators operating at —150° F. and transmitting readings to the control room, and liquid density recorders operating on crude oil.

Instrument men are scattered though every operating area of the refinery, including the laboratory. They do the work from start to finish when an unusual stress-relieving job is on hand at one of the units, either in the field or the machine shops. They help the Operating Department start up and shut down units and must approve and inspect the installation of every instrument when a new unit is installed by a contractor.

The Instrument Department has 137 men in the refinery, exclusive of the butyl rubber and butadiene plants, where 33 more are stationed in various capacities. This total figure of 170 men represents a jump of 166 in the 20 years of the department's existence, though the group represents less than 2% of Baytown personnel. Working under all kinds of conditions, with every kind of hazard present in any operating department, the instrument men have hung up an enviable safety record—715,000 man-hours without a lost-time accident from May 11, 1943 to Feb. 1, 1946.

The department is set up on the basis of non-specialization, except for electronic-type instruments where long study and training are necessary. Men are transferred from shop to field and rotated in field assignments to assure familiarity with every kind of job which may present itself. Instrument department jobs are sought after, with a long waiting list of applicants being a standard condition, not because the work is deemed a "soft-snap," rather is considered a stepping stone to advancement.

Organization and Responsibilities

For purposes of administration the refinery is divided into three field zones, the laboratories comprising a fourth and the instrument shop a fifth zone. The two government-owned, Humble-operated plants making butadiene and butyl rubber, respectively, are separate from the refinery although their instrumentation is under indirect supervision of the refinery instrument department.

The four field zones, exclusive of shops and "outside" plants, are further subdivided into a total of 19 areas, with an "instrument technician" responsible for all instrumentation in his own area. Depending on the area, each technician may be alone or may have on his staff one or more workmen of lower rating, such as first, second, or third-class repairman and helpers.

The instrument shop, in addition to personnel of all classes of workmen has an engineering section and two men classified as laborers for general clean-up work. A "shift field" and "shift shop" also are maintained for plant work during evening and "graveyard" shifts when most of the department is unmanned.

The engineering section has three divisions: engineers, corrosion control and clerical staff. The engineers perform all necessary engineering tasks in the instrument department and may be temporarily involved in any section, area or zone of refinery or the two "outside" plants. The corrosion group has the responsibility of corrosion control as it affects instrumentation. The clerical group keeps records on instruments and control equipment, and performs routine tasks such as flow calculations.

Specific responsibilities of the instrument department include:

1. Providing and maintaining of accurate and dependable measurement and control for refinery operation and processing.

2. The improvement of operating efficiency for units through revisions in size, range and application of instruments.

3. Maintaining complete records of all flow-meter installations for use of accounting, operating and technical departments.

4. Maintenance and repair of all relief valves and keeping records of tests.

5. Assisting process personnel in the instrumentation on features of starting up, shutting down and operating the various units.

6. Study of operating difficulties and recommending solutions.

7. Minimizing corrosion and scaling in fractionator and heat exchange equipment through instrumentation.

8. Keeping abreast of new developments in industrial instrumentation.

9. Cooperation with the laboratory on adaptation of special instrments (e. g. electronic devices for analytical purposes) and adapting these for plant use where possible.

10. Investigation of new materials for instruments and possible adaptations to refinery problems.

11. Arranging set-ups and performing preheating and stress-relieving of special metals. (The instrument department, of course, does not determine the metallurgical specifications for the work, this being the responsibility of another department.)

12. Conservation of materials and cooperation with other departments in carrying on their work.

Training of Personnel

In general, instrument department personnel are trained on the job, starting in as helpers. Men are selected from a waiting list of voluntary applicants from the general refinery personnel. In selecting men, particular attention is paid to evidence of mechanical skill, education and records of adaptability. Most all the men selected have high school educations, many have completed one or more years of college. Many leave higher paying jobs in the operating department, some of them experienced unit operators, for the chance to learn in general refinery operations and equipment, as well as instrumentation. Regardless of qualifications, all personnel start as helpers in the shop.

Helpers are given six months under close supervision before they qualify as helpers, second-class. If by that time they have shown adaptability to handle tools, learned what to do by observation and study of shop-written instrument manual, and observed safety practices as required, they are promoted. If not, they are returned to the general refinery ranks for reassignment.

During this six months trial period, the new men work in all departments of the instrument shop except the machine tool, electrical and special (electronic instruments) sections. If the prospect shows

ABOVE—Machining a large flow nozzle for measuring water flow. The nozzle was shop-designed and built with templates for machining made in minutes on a pantograph.

LEFT—Special heists and tools have been developed in Humble's instrument department to make work safer and easier. Shown in this photograph are a pair of tongs especially designed for lifting motor-operated flow control valves.

BELOW—Scene in the gauge room in the instrument shop where gauges are being calibrated against master-gauges at three scale points. In background can be seen one of the horizontal-type gauge testers developed in the shop.

special mechanical ability, he is assigned to the machine tool section as soon as a vacancy permits. Thus he becomes acquainted with the various types of meters, pressure and temperature gauges, relief valves, and so on.

From here on it is up to him to qualify for the successive grades of helpers first-class, repairman third, second, and first-class, and instrument technician. He is rotated from shop to field and back and from point to point in the field periodically. Repairmen first-class, and technicians only are eligible for the electrical section and only those with special ability and qualifications can be attached to the "special instruments" section.

Annual vocational courses for instrument department men have been the rule since 1937, although at the present time no courses are in progress. Subjects taught in these classes, with attendance purely voluntary and outside working hours, have included: theory of measurement of pressure, temperature, flow, liquid level and "special" measurements; flow calculation; pneumatic and electric transmission; pneumatic and electrical controls, including control valves. Numerous courses on pyrometry, instrument calculations (flow and liquid levels) have been held and, in addition, two courses on theory of electronics. Outside instructors of high caliber frequently have been retained for this instruction. In addition correspondence courses have been encouraged. In the past few years an average of 35 men have completed from one to two courses per year.

Shop Equipment

The instrument shop is well-equipped for almost any conceivable job of instrument work, as illustrated in the accompanying photos. Table 1 lists a few of the major shop jobs handled during 1945.

Overhead cranes run throughout the shop, extending to receiving and discharging aprons outside. There is no excuse for a man to lift heavy sections or equipment and risk having something get away from him. Special slings, tongs and other attachments are provided to guard against accidents and speed the work.

Pneumatic wrenches and nut-runners are provided for speed and comfort of the operator. An ingenious but simple foot-pressure screwdriver has been built to save straining and damaged fingers or equipment in removing large and small screws. A number of special clamps, vices and jigs have been developed for gauge glasses, liquid level cages, floats and certain types of meters. Similarly there are face-plates for relief valves, from the smallest up to 6-in. size, manifolded through gauges to a tank where test water up to 2500 psi and 5 gpm is available for any range of test conditions.

All pressure gauges of the dial-indicating type are checked on hydraulic testers, some of which have been specially designed or adapted for the work or operator's convenience. Test gauges in turn

are checked at least daily against master gauges which, in turn, are calibrated on precision deadweight testers.

A permanent set-up is maintained for testing displacement-type meters from 3/4-in. to 3-in. This prover is equipped to calibrate the meter at least three points on its scale through a flow-meter; throughput is discharged into weigh-tanks for double-check. In a roofed shed outside the shop is another prover for gas meters, equipped with standard volumetric equipment.

Outside the shed also is equipment specially designed by the instrument for cleaning gauge glasses with chemical solvents of the sulfonate type provided by the laboratory. Here in a system of tanks, provided with steam coils, gauge glasses are quickly cleaned and readied for reinstallation. This unimpressive-appearing but efficient gadget, states the department foreman, has more than paid for itself since its construction less than a year ago, and has practically eliminated the gauge glass cleaning problem.

Another important piece of shop equipment is a mechanical pantograph with all attachments (plus a few "invented" for special work) on which are cut face and name plates for gauges, manometers, flow meters and other instruments. Curvature templates for flow nozzles also are made on this machine in minutes instead of hours by other methods, through the invention of one of the department personnel. Other power equipment includes three lathes, a milling machine, one large and two small drill presses, power hacksaw and diamond cutting saw.

There are also in use in the shop, two water manometers, shop-built and designed, for calibrating meters, one of 200-in. and the other 150 in. length. Both are indirectly illuminated by a cold-cathode fluorescent light, have transparent scales engraved on lucite plastic with the mechanical pantograph. Each is equipped with periscopic optical system for precision reading from ground-level.

In the pneumatic instrument section a master test instrument and assembly, shop-built from scrap, is installed which will receive signals from an instrument on test, transmit signals, or control in response to signals. All the operations possible for an indicating, recording or control instrument may be tested on the one panel.

Equipment for making slide-wires used in special-range instruments is available, likewise for replatinizing and recalibrating conductivity cells, repairing and recalibrating pH meters, special resistance coils, boxes, potentiometer-type volt boxes and other precision electrical jobs.

Clocks are repaired in a special room, force-ventilated. They can be built or rebuilt as necessary.

Maintenance a Watchword

Procedure for instrument repair follows a strict routine. Every instrument or safety valve received must bear a permanent metal tag affixed at time of initial installation. The tag shows refinery property number, unit from which it came and size and rating, stamped into the metal. Before sending an instrument in for repair, it is the field technician's duty to see that it is tagged for identification and safety.

Excepted items are pressure gauges and industrial thermometers.

Depending on its past history and condition, the item is decontaminated, cleaned and readied for repair, then taken inside to the appropriate department. It is accompanied by one of several forms, developed by the department, which indicate the work necessary to be done. The majority of the forms bear a color code on the margin or are printed on colored paper for ready identification in the files.

The forms contain provisions for indicating what was done to the instrument and, in case of calibration, rebuilding, alteration or reinstallation, the pertinent information for the master records. Work for "outside" plants is so diversified that special forms have not been developed, a single form for each of the two plants sufficing.

These instrument department forms do not cover routine maintenance or repairs effected in the field. Area technicians for the instrument section are required to know the functions and use of each instrument in the areas for which they are responsible. This includes the necessary maintenance requirements between unit turn-arounds as well as procedure for emergency repairs. When a unit is down for turn-around, additional men either from other areas or the shop are temporarily assigned to the job, so that every instrument is adjusted or repaired at that time if necessary.

Humble's instrument men are fully equipped for field repairs. In this picture one of them is making a delicate adjustment on the galvanometer of a pyrometer mounted on the control panel of a Fluid Catalyst Cracking unit

As a result of this careful maintenance program, experience has shown a large stock of replacement instruments for emergency installation is not necessary; and the instrument department's store of "spares" therefore is small. However, a large stock of replacement parts is maintained at all times. They are even manufactured if emergency demands or the manufacturer is unable to furnish the part.

Nearly every type of instrument considered suitable for refinery use may be found somewhere in the Baytown plant. Many are more than 20 years old but in perfect repair. As rapidly as new types of instruments are commercially available, one is purchased for try-out if for no other reason than to avoid "passing up a bet."

Such instruments are carefully studied and men are provided with special information and instruction in their installation, trouble-shooting, operating function and repair. Much of this data is secured from the manufacturer in the case of new types of instruments.

Special Jobs Completed 1945

The department builds instruments for special purposes, or when a commercial instrument is not available. One such instrument of which the department is proud is a liquid density meter designed and built at Baytown, which determines and records liquid densities under pressure. Two now are installed at Hearne Pump Station to record crude oil gravities and their use makes possible accurate segregation of stocks. Patents are pending on the instrument.

The department completed a number of special jobs in 1945, interesting if

A late-type electronic temperature recorder-controller is receiving a final check at the instrument shop before going out for initial installation. Shop is equipped to test such instruments on indication, recording and control by exactly simulating operations in the field

only to show the diversity of work involved. Data on some is given below.

An expansion-indicator was built for the butyl rubber plant to study stress in reactors. Seven small venturi-tubes were designed and built.

For the laboratory a variable-path-length cell for measurement of infrared radiation in electronic hydrocarbon analysis was constructed. Two lamp-and-lens holders were designed and built for ultraviolet spectrophotometers at the butadiene plant and laboratory. A variety of rotameter floats also were built.

Replacement trim was manufactured for meter and control valves at the alkylation plant to eliminate acid corrosion difficulties.

A micrometer depth gauge was made for the knock testing laboratory.

A special nickel-steel internal float was designed, built and installed in a mixer at the sulfur dioxide plant.

Liquid level indicators with high-level alarms were made for mixers in the contact unit at the lube plant.

Radial-float liquid level indicators were designed, built and installed on two chillers in the propane plant, constructed to withstand temperatures to —150°F. Later, gear trains to transmit measurements through autosyn motors to the control room receivers were installed.

Other jobs included: conversion of an old temperature recorder to a differential controller with a sensitivity of 0.1° F. for the laboratory; repair of an electrophotometer; revision of a potentiometer to record percent oxygen; construction of an electronic liquid level controller for phenol service, and construction of a special potentiometer-type volt-box for an infrared spectrometer.

A boiler feedwater system was designed and installed for measurement and control of small quantities of chemicals for continuous treating. As a result, maintenance cost has been reduced and normal run increased for the high-pressure boilers. Investigation necessary for the design has developed practical information on discharge coefficients for small-diameter flow nozzles which will be used to increase accuracy of other small-flow installations.

Future plans of the department call for increased working space and additional equipment. Careful study of existing equipment in the refinery for possible operational improvement through instrumentation is high on the agenda.

TABLE 1—Major Items of Work Completed in 1945 in the Instrument Shop of the Baytown Refinery of Humble Oil & Refining Co.

Instrument clocks repaired	970
Control valves repaired	1,873
Control valves altered or replaced	78
Gage columns cleaned or repaired	1,509
Inspector's tube "mikes" repaired	182
Conductivity cells replatinized and recalibrated	23
Counters repaired	234
Liquid level controls, differential type, built	15
Liquid level controls, differential type repaired	55
Liquid level controls, float type, built	7
Liquid level controls, float type, repaired	160
Liquid level indicators, differential type, built	1
Liquid level indicators, differential type, repaired	2
Liquid level indicators, float type, built	2
Liquid level recorders, differential type, built	1
Liquid level recorders, differential type, repaired	11
Liquid level recorders, float type, repaired	1
Autosyn motors repaired	2
Other motors, overhauled	32
Manometers built (two types represented), total	108
Orifice meter manifolds built	88
Orifice meters overhauled	686
Orifice plates made, new	105
Orifice plates made, changes	229
Potentiometers overhauled	89
Potentiometers rebuilt	21
Potentiometers, repaired	176
Pressure controllers, built	1
Pressure controllers overhauled	27
Pressure controllers repaired	1
Pressure controllers, differential type, repaired	1
Pressure recorders, Bourdon type, overhauled	192
Pressure recorders, differential type, overhauled	5
Pressure recorders, differential type, built	1
Pressure gauges repaired	12,608
Pressure regulators altered or replaced	27
Pressure regulators repaired	429
Relief valves altered or replaced	178
Relief valves tested	5,903
Temperature controllers repaired	3
Temperature controllers (bulb type) repaired	4
Thermocouple tubemetal protecting tubes made	166
Thermocouple, chromel-alumel, made	250
Thermocouples, chromel-KA2S, made	11
Thermocouples, iron-constantan, made	3,294

Petroleum Topics Highlight A.C.S. Meeting

By B. H. Weil

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The recent meeting of the American Chemical Society at Atlantic City has demonstrated again that the petroleum industry makes bountiful use of chemical technology. Thirty three papers on petroleum topics were presented at sessions of the Division of Petroleum Chemistry, and approximately 100 pertinent papers at meetings of the other divisions. Brief abstracts of some of the more important of these papers are presented below.

THE petroleum industry has become one of the nation's leaders in science. This fact was never more clearly evidenced than at the 109th Meeting of the American Chemical Society, held in Atlantic City on April 8-12, since well over 100 of the more-than-500 papers presented were of direct or indirect interest to petroleum refining and allied fields.

The general meeting of the society, held on April 8, was highlighted by speeches presented by Secretary of War Patterson and Col. Bradley Dewey, president of the society and former Rubber Director. In his tribute to the chemists' contributions to the recent war effort, Patterson gave particular attention to the "nearly 50,000,000 incendiary bombs (which) were dropped by airmen" and the "nearly 260,000,000 aerial incendiaries" which had actually been produced. One of the "secret compositions that made the fire rains spatter and stick" was "Napalm", a jellied gasoline, also used with telling effect in flamethrowers, which became a " 'must' weapon on the stepping stones to Japan." Chemical fog was also mentioned as an outstanding achievement.

Col. Dewey, in his paper on "The Chemist and the Public," laid stress on the continued need for interest in national and world affairs which has been evidenced by chemists and other scientists in recent years. He discussed the role of chemistry in war and in peace, the pending science legislation, and the necessity of educating the public to understand "that the greatest good to the greatest number is realized only when every scientist who can make a scientific contribution is kept in his laboratory, not diverted to carry a gun." The blame for this nonapplication of "selective" service was placed squarely upon Selective Service policies, not on the armed services.

Petroleum Division

The Division of Petroleum Chemistry had 33 papers presented at its meetings, held on April 9-11. Much of the information presented dealt with hitherto undisclosed wartime advances, and a wide variety of topics was included.

Several of the papers dealt with methods of treating or processing petroleum fractions to improve their octane ratings and thus provide for their use as components of better gasolines.

Isomerization

Petroleum Division Hears How Isomerization Improves Octane Rating of Olefinic Gasolines

One such paper was presented by Lloyd Berg, George L. Sumner, Jr., and C. W. Montgomery of Gulf Research & Development Co., dealing with "The Octane Rating Improvement of Olefinic Gasolines by Isomerization." Octane number improvements of approximately 4 units can be obtained when such stocks as a debutanized, thermally cracked distillate are subjected to isomerization at 375-425° C., 0.3-1.3 hours,$^{-1}$ and atmospheric pressure over such catalysts as alumina activated by impregnation with hydrogen chloride. Liquid yields are reported to approximate 97-99%, and tests on individual olefins have proved that isomerization is the basic reaction, "with a minimum of such side reactions as cracking, hydroforming, treating, aromatization, and cyclization."

According to this paper, however, "thermodynamic considerations indicate an upper limit to the octane number obtainable by olefin isomerization. Obviously, then, the lower the octane number of the original charge, the greater the possibility for improvement by means of this isomerization."

Two papers presented at Petroleum Division meetings were concerned with the isomerization of paraffins, chiefly normal butane. In a paper entitled "The Isomerization of Normal Butane as Catalyzed by Aluminum Bromide; the Effect of Oxygen and Other Promoters on the Reaction," A. G. Oblad and M. H. Gorin of Magnolia Petroleum Co. reported that "oxygen was discovered to be an outstanding promoter for the isomerization reaction." Reaction rate and factors affecting oxygen and catalyst consumption were discussed and, on the basis of the studies presented, it was postulated that "a surface is necessary in order to assure a polar medium in which the reactions can take place."

R. C. Wackher and Herman Pines of Universal Oil Products Co. discussed the "Isomerization of Alkanes; the Water-Aluminum Halide Reaction and Isomerization of *n*-Butane with the Reaction Product." "By contacting *n*-butane at 25° C. with the catalysts obtained by the action of water on aluminum bromide, isomerization of *n*-butane occurred when the molal ratio of the water to $AlBr_3$ was 1, 2, or 3. When the molal ratio was 4, slight isomerization occurred at 25° C. but appreciably more at 80° C., while with a ratio of 6, *n*-butane did not isomerize at all.

In a paper presented before the Division of Organic Chemistry, these same two authors discussed the "Isomerization of Alkanes; deuterium Exchange in the Isomerization of *n*-Butane Using Deuterium Bromide—Aluminum Bromide and Deuteroxyaluminum Dibromide Catalysts." Reaction mechanisms were postulated on the basis of the deuterium exchange.

Alkylation

Papers on Mechanism of Alylation Reaction Provoke Heated Discussion: Socony-Vacuum Engineers Describe Ethylbenzene Production

Heated discussion was evoked by two papers presented to the Petroleum Division on the mechanism of the alkylation reaction. M. H. Gorin, C. S. Kuhn, Jr., and C. B. Miles of Magnolia Petroleum Co., in a paper entitled the "Primary Reaction Mechanisms in the Acid and Aluminum Halide Catalyzed Alkylation of Isbutane with Olefins," introduced "the definition of primary alkylation products as those alkanes which are formed preferentially and in high yields at low temperatures and short residence times. Formation of these products is ascribed to the simple addition of methyl and isopropyl fragments (from isobutane) to the olefin."

Robert F. Marschner and Don R. Carmody of Standard Oil Co. (Indiana), in their paper on "the Mechanism of the

Alkylation of Isoparaffins," contend that direct evidence shows that "the alkylation of isoparaffins with olefins involves an important isoparaffin condensation reaction, accompanied by reduction of the olefin to the paraffin."

The synthesis of neohexane, triptane, and similar branched-chain paraffins of structures which might be expected by "the interaction between tertiary or secondary carbon atoms of paraffins and unsaturated carbon atoms of olefins" was discussed by A. A. O'Kelly and A. N. Sachanen of Socony-Vacuum Oil Co. Their paper, entitled "Alkylation of Paraffins in Presence of Homogenous Catalyst; synthesis of Neohexanes and Triptane," described the use of "small amounts of halogenated, nitrogen, or oxygen compounds as catalysts at temperatures ranging from 300° to 400° C. and under pressures of the order of 3000 psi or more." Only 4-8% of triptane is obtained when isobutane is thus alkylated with propylene, and its separation from its isomers "presents enormous practical difficulties due to the closeness of the boiling points."

Two papers were presented on the production of ethylbenzene by the alkylation of benzene with ethylene; both were contributions from Socony-Vacuum. The first, on "Ethylbenzene. High Yields and Rate of Production by Liquid-Phase Ethylation" was prepared by Alfred W. Francis and E. Emmet Reid and described once-through yields as high as 80%, obtained by using higher-than-conventional temperatures (100° C.) and pressures (100-300 psi). The second paper, "Monoalkylbenzenes by Vapor-Phase Alkylation," prepared by A. A. O'Kelly, J. Kellett, and J. Plucker, dealt with the use of commercial cracking catalysts and described monoethylbenzene yields of 80-85%; the process is susceptible to the use of "a (continuous) cycle operation such as is used in catalytic cracking."

Polymerization

Polytreating of First-Pass Catalytically Cracked Gasolines Aims at Overcoming Undesirable Olefinic Content with Low Lead Susceptibility

At one meeting of the Petroleum Dision, Vladimir Haensel and V. N. Ipatieff of U. O. P., in a discussion of the "Polytreating of Catalytically Cracked Gasolines," mentioned that "the olefinic content of such gasolines, by virtue of their low lead susceptibility, are considered less desirable" than the branched paraffinic and aromatic compounds. They described the treating of such "first-pass catalytically cracked gasolines in the presence of solid phosporic acid catalysts" at 400-560° F. and 400-800 psig (preferably about 600 psig), the pressure serving primarily to maintain a liquid phase.

Boyd E. Hudson, Jr., Richard F. Robey, and Charles E. Morrell of the Esso Laboratories of Standard Oil Development Co. presented a paper which dealt with "Some Properties (composition, density, total and partial vapor pressures, and tendency to polymerize) of Isobutylene in Sulphuric Acid." "The rate of polymerization of isobutylene in the solutions appears to be unimolecular with respect to the molar acid concentration and independent of the olefin concentration in the temperature and concentration ranges studied."

The "Polymerization of Pentenes" was discussed by V. N. Ipatieff and R. E. Schoad at a session of the Division of Organic Chemistry. Solid phosporic acid was used as the catalyst, and "the pentene polymers obtained consisted mainly of branched-chain decenes, which were hydrogenated to decanes with octane numbers of 94.6."

Catalysts and Catalysis

Leading Position of Petroleum Industry in Field of Catalytic Chemistry Is Evidenced by Interest in Papers on that Subject

The petroleum industry is rapidly becoming a leading member of the family of "catalytic chemical industries." For this reason, several papers on catalysts and catalysis were received with considerable interest.

Before the Petroleum Division, Herman E. Ries, Jr., Robert A. Van Nordstrand, and William E. Kreger of Sinclair presented a paper on "Adsorption-Desorption Isotherm Studies of Catalysts; II—A Comparison of Low-Temperature Isotherms of Ammonia and Nitrogen." Results obtained were discussed "with respect to surface area values, hysteresis characteristics, pore volume, pore radii, and heat adsorption."

Numerous papers on catalysis were presented at sessions of the Division of Physical and Inorganic Chemistry. The "Role of Surface Area in Dehydrocyclization Catalysis" was considered by Allen S. Russell and John J. Stokes, Jr., of the Aluminum Research Laboratories, who experimented with alumina-molybdena catalysts for the atmospheric production of toluene from *n*-heptane. Experiments showed that maximum catalyst activity was reached when the activated alumina surface is covered with a monolayer of molybena.

P. W. Selwood of Northwestern University, described "A New Magnetic Principle Applied to the Structure of Catalytically Active Solids." Chromium ions in chromia-alumina catalysts were found "to have the environment of a magnetically dilute solution," thus making "available a measure of the degree of dispersion of chromium atoms supported on alumina. . . . This method has been shown to be applicable to supported molybendum oxide catalysts and is, presumably, applicable in general to catalysts containing transition group elements."

The "Surfaces of Solids; a Unitary Thermodynamic Theory of the Absorption of Vapors on Solids, and of Insoluble and Soluble Films on a Liquid Subphase" was considered by George Jura and William D. Harkins of the University of Chicago and U. O. P. The conclusion was reached that "the behavior of films on the surface of solids is the same as that on liquids."

Technical Data

Graphical, Mathematical and Physical Methods Described for Obtaining Highly Important Technical Data Concerning Hydrocarbons

Many papers presented at the meeting were concerned with technical data and methods of obtainment. V. A. Kalichevsky of Magnolia Petroleum Co., noting that "heavy petroleum fractions should be regarded as a continuous phase exhibiting a gradual rather than an abrupt change in properties with the increase in refining severity," has applied infinitesimal analysis to the "Calculation of Solvent Extraction Equilibria." "The method may be applied for comparing relative solvent efficiencies on a mathematical basis, which has not been possible in the past."

In another Petroleum Division paper, W. Andrew Wright of Sun Oil Co. presented information on a new graphical procedure for the "Calculation of Viscosity in Oil Blending." M. R. Lipkin and C. C. Martin, also of Sun, described an equation which makes possible highly accurate calculations of specific dispersion, even on highly colored samples; the paper was entitled "New Method for Calculation of Specific Dispersion of Pure Hydrocarbons and Petroleum Fractions."

Three papers were presented which give additional results of work on API Research Project 44, sponsored jointly by the National Bureau of Standards. Edward J. Prosen, Walter H. Johnson, and Frederick D. Rossini gave data on "Heats of Combustion and Formation at 25° C. of the Alkylbenzenes Through $C_{10}H_{14}$, and of the Higher Normal Monoalkylbenzenes"; John E. Kilpatrick, Edward J. Prosen, Kenneth S. Pitzer, and Frederick D. Rossini presented information on "Heats, Equilibrium Constants, and Free Energies of Formation of the Mono-olefin Hydrocarbons Through the Hexenes and of the Higher 1-Alkenes"; and William J. Taylor, Donald D. Wagman, and Mary A. Greaney joined with Pitzer and Rossini in presenting data on "Heats, Equilibrium Constants, and Free Energies of Formation of the Alkylbenzenes Through C_9H_{12} and of the Higher Monoalkylbenzenes."

Pitzer, who is now at the University of California, presented a paper on "The Entropies of Branched Paraffin Hydrocarbons" at the Symposium on Low Temperature Research held by the Division of Physical and Inorganic Chemistry and

another paper on "The Relationship of Molecular Structure to Specific Heat" at another symposium of that division, at which he presided. Another interesting paper at the first symposium was that on "Low Temperature Calorimetry at the Bartlesville Station of the Bureau of Mines," presented by H. M. Huffman of that organization, while the second symposium, "on the relation of other properties of molecules to their structures," included papers on "Energy Content and Structure of Hydrocarbon Molecules" by Frederick D. Rossini and the "Intramolecular Rotation of Polar Groups," by Charles P. Smyth of Princeton University.

Guy Waddington, Samuel S. Todd, and Hugh M. Huffman of the Bureau of Mines Petroleum Experiment Station, at a general session of this division, presented data on the "Experimental Determination of the Vapor Heat Capacities of *n*-Heptane and of 2,2,3-Trimethylbutane, (triptane)," and John W. Knowlton joined with Huffman in a report on "The Heat of Combustion of Tetraethyl-Lead." H. L. Fink, M. R. Cines, F. E. Frey, and J. G. Aston of Pennsylvania State College presented a paper on "Solid Solution Studies. Equilibria in the Binary Systems 2,2-Dimethylbutane—2,3-Dimethylbutane and 2,2-Dimethylbutane—Cyclopentane." Also of interest were papers on the "Infrared Spectra of Tetramethyl Compounds," by C. W. Young, D. S. McKinney, and J. S. Koehler of Carnegie Institute of Technology and "The Infrared Absorption Spectra of the Fluro-Chloro Methanes" by J. J. McGovern (now of the Mellon Institute) and Koehler and McKinney of Carnegie Tech.

N. Bruce Hannay and Charles P. Smyth of Princeton University presented a paper on "Dipole Moment and Resonance in Vinyl Sulfide and Six Unsaturated Chlorohydrocarbons," and these same authors also dealt with "The Dipole Moments and Structure of Ketene and of Several Polar Molecules Containing Conjugated Systems."

In a paper before the Petroleum Division, Nancy Corbin, Mary Alexander, and Gustav Egloff presented some important equations for the calculation of "Molecular Volumes of Mononuclear Aromatic Hydrocarbons." As the authors state, "liquid density data for many aromatic hydrocarbons are not available in the literature."

Synthetic Liquid Fuels

Fischer-Tropsch Catalysts and High-Pressure Gasification of Coal Are Discussed Before Division of Gas and Fuel Chemistry

As Col. Bradley Dewey said in his address before the General Session, "history will show future generations how effectively to use more sunlight and more of the things that are around us and how to be less and less dependent upon the resources that have led to many a war. Many a petroleum man regrets that he won't be able to live to enjoy all of the fun which will come to those who will make the fuels of the future from low-grade coals." Nevertheless, there is no assurance that liquid fuel synthesis from natural gas and oil shale may not be required in the predictable future, and a considerable amount of attention was given to all these topics at various sessions of the meeting.

C. H. Riesz, Fred Lister, and V. I. Komarewsky of the Institute of Gas Technology, in a paper on "Catalysts for Hydrocarbon Synthesis," presented additional data to support their theory "that the synthesis catalyst is in reality a 'complex-action' catalyst which provides a surface-combining hydrogenating ability for reduction of carbon monoxide with methylene and polymerizing ability for combination of methylene groups into higher hydrocarbons." Other factors are admittedly involved, but the theory offers the possibility of eventually making possible the prediction of the activity of potential Synthine (Fischer-Tropsch) catalysts from a knowledge of the specific functions of their components.

"The High-Pressure Gasification of Coal," or, more specifically, the process developed by the Lurgi Gesellschaft, was discussed in considerable detail by H. M. Weir, a Philadelphia consultant who was a member of one of the teams which gathered German fuel data. Roughly-sized, noncaking coal or coke of 2-10 mm. size is continuously charged to a fuel bed of 1-2 meters depth, which is "continuously blasted with a mixture of steam and oxygen." After cooling, tar and distillate removal, and other purification under pressure (about 20 atmospheres is normally maintained in the entire system), the gas produced has a typical analysis of 48-49% H_2, 22-24% CO, 25-29% methane, and small quantities of higher hydrocarbons, N_2, and CO_2. It is thus apparently suitable for city gas and, obviously, as raw material for the Synthine production of hydrocarbons.

Atomic Energy

Symposium on Nuclear Energy Told "There Is No Possibility That Atomic Power Ever Can Be Used to Propel Ordinary Automobiles"

The petroleum industry continues to be highly attentive to developments in the field of atomic (nuclear) research. As Glenn T. Seaborg of the University of Chicago told a "Symposium on Nuclear Research" held by the Division of Physical and Inorganic Chemistry, however, "there is no possibility that atomic power ever can be used to propel ordinary automobiles because of the huge steel or concrete shielding needed for protection from the radiation of any atomic energy machine, but large stationary power plants which might be used for space heating or in which the heat energy in the form of a hot fluid might be used in some industrial process are definite possibilities." Seaborg predicted that "atomic energy will eventually be able to compete with the common sources of energy even from the standpoint of economics."

In addition to his introduction, in which he also discussed the types of international controls needed to permit the safe industrial use of nuclear reactions and their by-products, Seaborg presented a review of "The Chemical and Radioactive Properties of the Heavy Elements." The symposium also included papers by W. F. Libby (University of Chicago) on "The Chemistry of Energetic Atoms Produced by Nuclear Processes," by Milton Burton (Monsanto Chemical Co.) on "Radiation Chemistry," and by Charles D. Coryell (Monsanto) on "Radiochemistry and the Fission Products."

Two interesting papers on the "Effects of Radioactivity on Fatty Acids" and "Conversion of Cyclohexanecarboxylic Acid to Hydrocarbons by Radioactivity" were presented before the Division of Organic Chemistry. Reporting work performed at M. I. T. by Charles W. Sheppard and Virginia L. Burton, and Irving A. Breger and Miss Burton, respectively, the papers stated that the bombardment of fatty acids with alpha particles (deuterons, in the second case) yields saturated and unsaturated hydrocarbons (with the former predominating) and that the decarboxylation which occurs apparently does not cause ring cleavage where rings are present. This work indicates that "radioactivity may be a factor in petroleum genesis."

Petroleum Chemicals

Butadiene, Pyrolysis of Pentenes, Styrene, Aliphatic Nitriles, Organic Peroxides Are Included Among Products Discussed

A very large number of papers dealing with chemicals producible from petroleum was presented at the various sessions of the meeting. Butadiene, for example, came in for considerable attention. In a paper before the Petroleum Division on "Depolymerization of Butadiene Dimer," Thomas F. Doumani, Roland F. Deering, and Art C. McKennis of Union Oil Co. of California discussed the depolymerization of the liquid polymers (chiefly dimers) which form by thermal polymerization during handling and storage. "Depolymerization of dimeric butadiene has been accomplished at temperatures from 510° C. (950° F.) to 704° C. (1300° F.) and at atmospheric pressure both in the presence and absence of steam. . . Trimeric and tetrameric butadiene are more difficult to depolymerize than the dimeric form."

E. Gorin, A. G. Oblad, and R. F. Schmuck of Magnolia Petroleum Co., in

a discussion on "The Primary Reactions in the Pyrolysis of Pentenes," told the Petroleum Division that "butadiene is the major diolefin produced in the pyrolysis of pentene-1 and pentene-2. . . . Isoprene is the principal diolefin produced in the pyrolysis of the tertiary pentenes. . . . The paraffinic constituents in the pentane-pentene mixtures were found not to contribute appreciably to the production of diolefins in the cracking of these mixtures."

According to a paper by C. E. Starr, Jr., and W. F. Ratcliff of the Louisiana Division of the Esso Laboratories of Jersey Standard, the "Impurities in Butadiene from Petroleum," usually produced in concentrations in excess of 98%, are chiefly the butenes and minor amounts of C_3 hydrocarbons.

Before the Petroleum Division, Julian M. Mavity, Earl E. Zetterholm, and George Hervert of U. O. P. presented a paper on "Styrene Production by Catalytic Dehydrogenation Operation at Ordinary Pressure Using Benzene as Diluent." An ultimate styrene yield of 87.7 wt.-% was indicated. In a paper presented to the Division of Industrial and Engineering Chemistry, Lloyd Berg, J. M. Harrison, and C. W. Montgomery of Gulf Research & Development Co. declared that "The Azeotropic Purification of Styrene," combined with ordinary rectification, makes it possible to remove any hydrocarbon impurity from styrene.

Several other interesting papers on chemicals were presented to the Petroleum Division. John W. Teter, Leonard E. Olson, and Herman E. Ries, Jr., of Sinclair described some details of the catalytic synthesis of "Aliphatic Nitriles From Olefins and Ammonia," including a discussion of known economic derivatives. Adalbert Farkas, Andrew I. Smith, and Arthur F. Stribley, Jr., (Union Oil Co. of California) described certain "Organic Peroxides From Petroleum," chiefly hydrocarbon hydroperoxides, which are marketed under the trade name "Uniperox" as an "excellent polymerization catalyst for unsaturated compounds such as styrene, allyl esters, and styrene-butadiene mixtures" and as "an efficient ignition accelerator" for Diesel fuels.

Plastics

Many Plastics Derived from Petroleum Included in Papers; Special Attention Given Styrene Polymers

So many papers were presented on those plastics possible of derivation from petroleum that details of their contents cannot possibly be listed here. Silicone resins, polyamides, styrene polymers, vinyl polymers, polytetrafluoroethylene (a new plastic announced by du Pont), vinyl alkyl ethers, copolymerization in suspension, acrylic resins, polyesters, and other topics all came in for their share of attention before the Divisions of Organic Chemistry; Physical and Inorganic Chemistry; Industrial and Engineering Chemistry; and Paint, Varnish, and Plastics Chemistry.

Special attention was given to styrene polymers and those prepared from chlorinated styrene derivatives. An interesting paper on "New Plastic Compositions for Dielectric Applications" was presented; as well as one on "Degradation of Vinyl and Diene Polymers."

Analysis

Seven Papers Presented on Analytical Methods that Are Concerned with Hydrocarbon Materials

Four papers relating to this subject were presented at the opening session of the Petroleum Division. These were "Assembly, Testing, and Operation of Laboratory Distilling Columns of High Efficiency," by Charles B. Willingham and Frederick D. Rossini (A. P. I. and National Bureau of Standards); "A Small Glass Center-Tube Fractionating Column," by E. A. Naragon and C. J. Lewis (The Texas Co.); "Determination of Cyclopentadiene and Dicyclopentadiene," by Karl Uhrig, Eleanor Lynch, and Harry C. Becker (The Texas Co.); and "Determination of Ethylacetylene and Vinylacetylene in C_4 Hydrocarbon Gases," by Paul R. Thomas, Leon Donn, and Harry C. Becker of the same company.

Three pertinent papers were also presented before the Division of Analytical and Micro Chemistry: "Determination of Aromatics and Naphthenes in Complex Hydrocarbon Mixtures Containing Unsaturates," by R. M. Love et al (Humble Oil and Refining Co.); "Chemical Analysis of Aromatic Compounds by the Ultraviolet Absorption Spectrum of the Vapor Cresols," by W. W. Robertson et al (U. of Texas); and "A Simplified Method for the Analysis of Oil-Soluble Petroleum Sulfonates," by Francis Brooks, Edward D. Peters, and L. Lykken (Shell Development Co.

Other Petroleum Topics

Studies of Superfractionation and Lubricating Oil Components Also Receive Attention

Also presented to the Petroleum Division were papers on "Superfractionation Studies; Composition and Octane Number of 0.5% Fractions From an Oklahoma City Naphtha," by C. C. Ward, R. M. Gooding, and B. H. Eccleston of the Petroleum Experiment Station, Bureau of Mines, and one on "Inhibitor Susceptibility of Some Possible Lubricating Oil Components," by E. C. Hughes, W. E. Scoville, and J. D. Barthleson of the Standard Oil Co. (Ohio).

Technical Libraries

Techniques Discussed for Filing and Indexing Published Information.

It is obviously appropriate for technical societies to discuss technical library techniques and for petroleum companies to view these discussions with interest, for this very A. C. S. meeting was typical of the flood of published information which threatens to become unmanageably complex unless proper and continued attention is given to its use. Methods for such use in the "Technical Library of Tomorrow" were discussed by Norman C. Hill (Pittsburgh Coke and Chemical Co.), who presided at the symposium held by the Division of Chemical Education.

Considerable interest was evoked by two papers on "Punch Card Techniques and Applications," by Robert S. Casey and C. F. Bailey (W. A. Sheaffer Pen Co.) and Gerald A. Cox (Corn Products Refining Co.), and "The Bibliographic Revolution (through use of I. B. M. punch cards and sorting guides)," by C. D. Gull (Library of Congress). Classification schemes were discussed, and an extra evening session was held on the subject.

Florence Harden (Schimmel & Co., Inc.) presented an interesting paper on "Technical Publications Issued by Foreign Governments and By Foreign Chambers of Commerce." "Wartime Scientific Periodicals" were discussed by E. J. Crane, editor of *Chemical Abstracts;* "Searching the Russian Technical Literature" was the topic of a paper by J. G. Tolpin (Universal Oil Products Co.); and James W. Perry (M. I. T.) presented a discussion on "Chemical Russian, Self-Taught; Russian Organic Chemical Nomenclature."

Highlights of the symposium were addresses on "The Publication Board and Its Function in Disseminating Scientific Information from Government-Sponsored Research and Enemy Sources," by John C. Green, secretary of this Department of Commerce board, and "The Patent System in the United States," by Casper W. Ooms, Commissioner of Patents. Green presented an interesting description of the functions, growth, handicaps, and plans of his group. Important information is being made available, and it is deplorable that a Government accounting technicality has made it necessary to issue most reports in the form of high-cost photostats and microfilms.

Commissioner Ooms discussed the plans of his office for a more adequate revision of the patent classification system and made a plea for the preparation of more lucid patent documents. He indicated that the Patent Office would require the use of more descriptive titles. Incidentally, an interesting paper on "Patentability of Organic Compounds" was presented at another Chemical Education session by I. J. Fellner (Patents and Trade Marks), who stated that "the apparent change of standards (regarding increasing difficulty in obtaining adequate patent protection) is not a judicial ruling by the Patent Office, but a natural consequence of our refined judgment developed by the advancement of the chemical art."

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PLANT PRACTICES

. . . for refinery Superintendents and Foremen

Practical Tips and Ideas Based on Actual Refinery Operating Experience

This month's suggestions from plant men include (1) a safe and quick way to remove old nipples from flanges, (2) a panel for field-checking motor-operated valves, (3) uses for photoelectric cells in flow control, (4) ideas on how to bend pipe in the field, (5) an economical method for precision control of high-pressure flow in pilot plants, (6) an adjustable welding stand, (7) the use of conversion curves to aid in reading "log" type instrument charts, and (8) a time-saver in identifying thermocouple wires when one is iron.

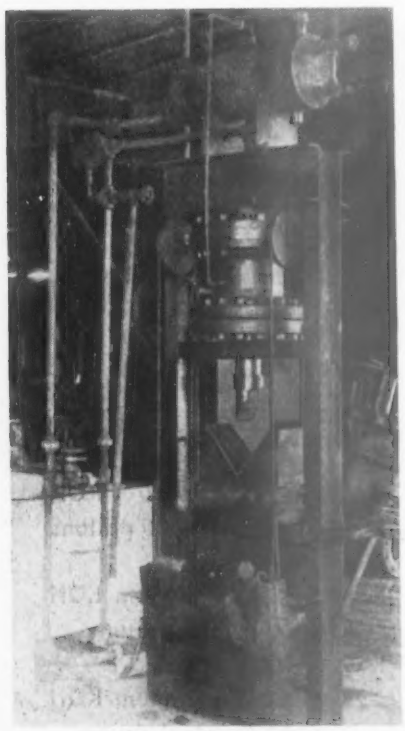
Hydraulic Nipple Crusher Is Safe, Speeds Up Removal of Fittings from Salvage Flanges

By B. I. BELL—Houston Refinery, Sinclair Refining Co.

Designed with safety as the primary consideration, this hydraulic nipple crusher also effects a large saving in labor and time in the removal of nipples from salvage flanges when compared with the old method of hammer and chisel.

As shown in the photograph, the unit consists of a sturdy I-beam frame supporting an hydraulically-driven ram. The ram forces a chisel into the side of a nipple frozen in a flange, the nipple being supported on a table built in the frame. The nipple is placed in a V-shaped notch cut into a heavy metal block. By inserting flat metal plates under the block, it can be shimmed up to enable the unit to handle pipe varying from 2 in. to 12 in. in size.

Chisels Nipples from Flanges



This hydraulic nipple crusher is in use at the Houston plant of Sinclair Refining Co. Pumps are under the hood at left, oil supply is in tank atop unit

A small drum atop the frame supplies oil to the pumps, which are enclosed in the metal box at the side of the unit. The pumps consist of two Hills-McKenna double-acting hydraulic rams driven through a 29 to 1 ratio reduction worm gear by a 1 H.P., 1700 R.P.M., electric motor, and deliver approximately 2 g.p.m. One minute is required to completely fill the pressure cylinder. Closing a valve in a bypass around the suction and discharge of the pumps allows the discharge pressure to build up in the hydraulic cylinder and force the piston down.

The cylinder consists of 10-in. pipe with an inside diameter of 9.75+ in. The piston is attached to the 4 in. diameter ram, which travels 6¼ in. The ram has a crosshead fastened to it, and is counterbalanced by weights suspended on cables attached to the two ends of the crossarm and carried on pulleys at the top of the frame. A tap in the side of the cylinder allows the cylinder pressure to be relieved by venting back to the oil drum when the piston comes down far enough to go past the tap, thus preventing a dangerous pressure buildup in the system before the piston can reach the end of the cylinder.

A pop-valve is provided on the pump discharge line and is set at 600 psi, well below the limit of the piping; it pops if the machine encounters a job too heavy for it. In operation, one man holds the flange and nipple in place while another man starts the ram down. When contact is made, the first man moves away, and the nipple is crushed as the operator watches through a safety glass shield.

Panel Speeds Field Check Of Motor-Operated Valves

An instrument mechanic at Standard Oil Co. of New Jersey's Baton Rouge, La., refinery has developed a simplified test panel for checking motor-operated control valves which reduces the necessity for transporting the operating element to the instrument shop for adjustment. Many times on unit turnaround it has been found that many of these elements need only a clean-up, lubrication and adjustment before going back into service, but to test them and make the required adjustments ordinarily requires moving them to the instrument shop where the necessary facilities are available.

A light steel plate, large enough to carry two indicating pressure gauges, a pressure regulator and two hose connections plus the necessary connections between them, was welded to a piece of boiler-plate to form a stable base. In use, a hose is connected to the air supply at the unit from the panel, and from the panel to the valve-actuating element

Wanted — IDEAS!

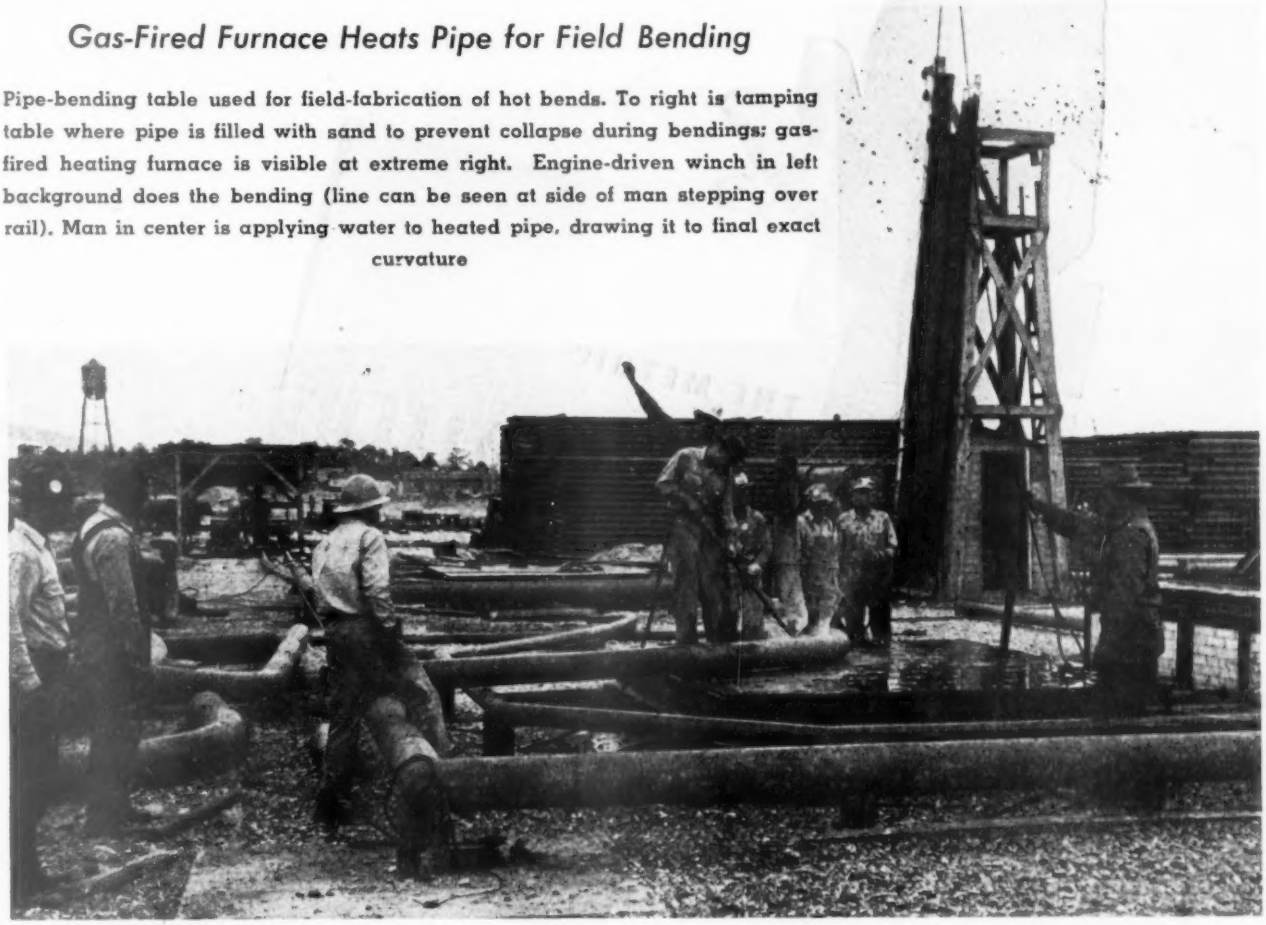
Plant operators, foremen and superintendents are invited to send in their own contributions of "how we do it around our refinery". Possible subjects could include maintenance and repairs ideas, inspection procedures, operating shortcuts — anything which has made your refinery more efficient and easier to run. Include photographs, drawings or sketches, if available.

Material accepted for publication will be paid for at our regular space rates. Contributions should be addressed to:

Plant Practices Editor
National Petroleum News
Technical Section
1213 West Third Street
Cleveland 13, Ohio.

Gas-Fired Furnace Heats Pipe for Field Bending

Pipe-bending table used for field-fabrication of hot bends. To right is tamping table where pipe is filled with sand to prevent collapse during bendings; gas-fired heating furnace is visible at extreme right. Engine-driven winch in left background does the bending (line can be seen at side of man stepping over rail). Man in center is applying water to heated pipe, drawing it to final exact curvature



under test. Air-pressure is adjusted to move the valve-motor from one limit of its travel to the other by means of the regulator; the mechanic then can determine at once if it is operating properly. If not, the necessary adjustments frequently can be made at once in the field, instead of shopping the valve.

At major units this panel is placed on a "collapsible" workbench supported by folding steel legs fabricated from scrap. The bench, large and sturdy enough for use in ordinary field repairs, is kept at the unit, folded up and stored in an out-of-the-way spot when not in use. It affords a convenient place to work and saves the man many trips between unit and shop.

Photoelectric Cells Serve As Flow Control Alarms

Photoelectric cells may be used to advantage as control alarms on caustic treaters, product flow lines and liquid level controls or indicators. In one new plant, Warren Petroleum Corp. expects to install such a device, although it has not been decided whether it will operate on white or ultra-violet light.

In use on a product flow line or caustic treater, for example, a look-box is installed in the line, the cell mounted on one side and light source on the other. Adjustment would depend on either change of color of the material in the line or its refractive index.

As a liquid-level controller or control alarm, the device would be mounted as for the product line on a gauge-glass. It could be set to indicate either when the liquid level was too high or too low, by using two instruments; by setting on one point and operating a control valve through an electric relay, the installation can be made to control liquid level in the container.

Bending Pipe in Field Requires Experience And Know-How to Obtain Good Results

Pipe-bending, which looks and sounds so simple, in reality is a job requiring considerable skill and experience; usually there is no guide or rule book but to learn how the hard way. The illustration shows a common scene around the site of Cities Service Refining Corp.'s Tutwiler refinery at Lake Charles, La. when the plant was being built. In this case the pipe is 6-in. extra-heavy steel, containing 0.035% carbon.

The pipe-bending table is shown in the center of the picture. Usually consisting of a large plate of heavy steel, perforated with holes for bars or clamps used to hold the pipe, the table generally is mounted on concrete to assure stability and ruggedness. Around it are low railings which act as supports for the pipe while it is being bent.

To the right is the tower-like structure called a tamping table. Here the pipe is filled with sand, which is packed in tightly by bouncing the pipe up and down on a piece of timber. The sand prevents the pipe from collapsing or wrinkling as it is bent. In a pipe shop, dry foundry sand is generally used; in the field any clean, dry sand available is the medium. Sand is tamped or packed into the pipe so tightly, as far as the bend-area is concerned, that plugs are not necessary in retaining it for the little handling the pipe gets after tamping.

At the extreme right of the picture may be seen the furnace used for heating the pipe, usually gas fired. Here is where know-how first comes in: How hot should the pipe be heated? How much area should be heated? There aren't any definite answers. Usually the degree of heating depends on the size of the pipe and thickness of its walls; seldom is pipe heated beyond a very

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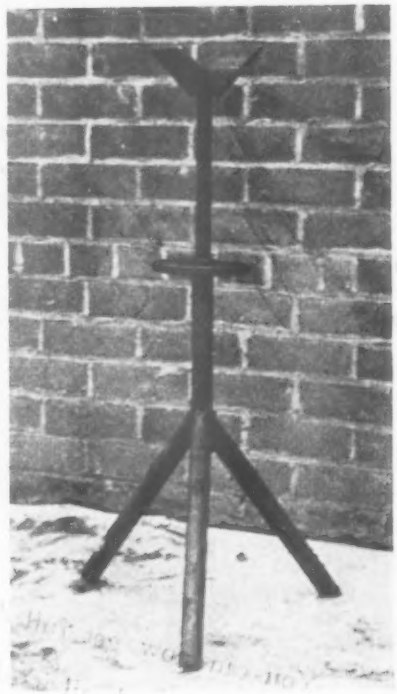
dull red, and small pipes can be bent just as satisfactorily in the cold as when heated — witness a plumber in your home, or an electrician installing metal conduiting.

The bend area to be heated is a matter of experience again. Generally the whole bend area is heated, but this may extend slightly over the bend area, in the experience of the pipe-bender doing the job. Usually difficult to detect, the bend actually extends over an area slightly larger than is apparent on any but the most careful inspection, and whether or not this portion is heated (other than by conduction through the metal) depends on the size of the pipe, the metal and the judgment of the bender.

In bending, the heated pipe is placed on the bending table by crane, the "free" end held in place on the table by a bar on each side—or a clamp—and the other attached to the winch cable. Sometimes, instead of a winch the pipe is bent by inserting bars into the holes of the table and prying it into the desired curvature. The radius of curvature also is outlined on the table by means of bars inserted into the holes and the pipe pulled against them during bending, but this is only approximate since due allowance must be made for spring-back or contraction of the pipe as it cools.

Aid to Better Welding



Welding stands such as the one pictured above are adjustable and light, speed up work, and make it easier to obtain clean joints

Obtain Precision High-Pressure Flow Control With Jet-and-Plug Type Valves on Pilot Plant

Need arose for precision control of minute high-pressure fluid flows on a pilot plant at Humble Oil & Refining Co.'s Baytown refinery. Conventional seat-and-plug of the usual motor-operated control valve proved inadequate unless multiple units of standard motor valves and control assemblies were used, at a prohibitive cost. The only alternative was hand-control at an intangible cost.

An instrument repairman suggested using resistance-type jet-and-plug motor operated valves, retaining the commercial make of control assembly then in use. The idea, as shown in the sketch, Fig. 1, is to control flow by adding or removing resistance to flow by means of the tapered plug.

Three such control valves were installed on the unit and eight more after the idea proved a success. Uniform flow and pressure control were maintained with extreme exactness, according to reports, while frequent overhauling and cleaning necessary with the conventional valve was eliminated.

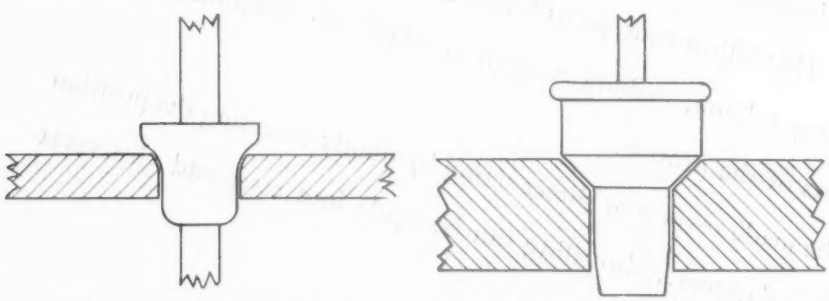


Fig. 1—Conventional seat-and-plug valve, left, failed to give precise control of minute fluid flow at high pressures on pilot plant installation. Jet-and-plug type valve, right, gave precise exactness, required infrequent maintenance and eliminated need for hand control or use of multiple units of conventional type at prohibitive cost

Adjustable Welding Stands Built from Scrap Metal

Small, adjustable stands such as the one illustrated in the accompanying picture greatly facilitate shop welding of lengths of pipe and other metal shapes at the Trenton refinery of Socony-Vacuum Oil Co., speeding up the work and making it easier to obtain cleaner and more accurate joints.

The work to be welded is supported in the "V" trough at the top of the stands, each piece being held in position at any desired angle with relation to the other piece or pieces. Two or more stands are used as may be required.

Scrap parts and metal around the refinery were used to build the stands, which are of welded construction. The tripod legs and lower portion of the stand are 1-in. pipe.

The upper portion is a ⅞-in. threaded rod, which screws through a hexagonal nut resting on top of the lower half of the stand. On top of the rod is welded a 6 in. length of 4 in. by 4 in. angle iron, to form the trough into which the work being welded can be set.

The hexagonal nut is fastened by two arms in the center of a ring (about 5 in. in diameter) for ease of handling. The height of the stand is adjusted by changing the position of the nut on the threaded top half.

Conversion Curves Helpful For "Log" Type of Charts

Conversion curves for instrument charts of the "log" type are time-savers for instrument mechanics. In checking or making settings for instruments using "log" type charts, which do not show the actual pressure, it is necessary for the repairman to calculate the pen position for any given pressure to determine proper instrument indication. This takes time, and there is also the possibility of arithmetical error.

A conversion chart plotted with actual pressure vs. indicated chart reading makes it possible for the mechanic to determine proper indication at a glance, determining actual line pressure with a test-gauge temporarily installed for the purpose.

Identifying Thermocouple Wires

In connecting iron-constantan couples to pyrometers, the use of a magnetized screwdriver is a time saver in unquestionably identifying the iron wire of the pair. Most mechanics customarily use magnetized screwdrivers for convenience in starting screws in tight places, hence using them for this purpose also renders it unnecessary to have a small magnet in the repair kit.

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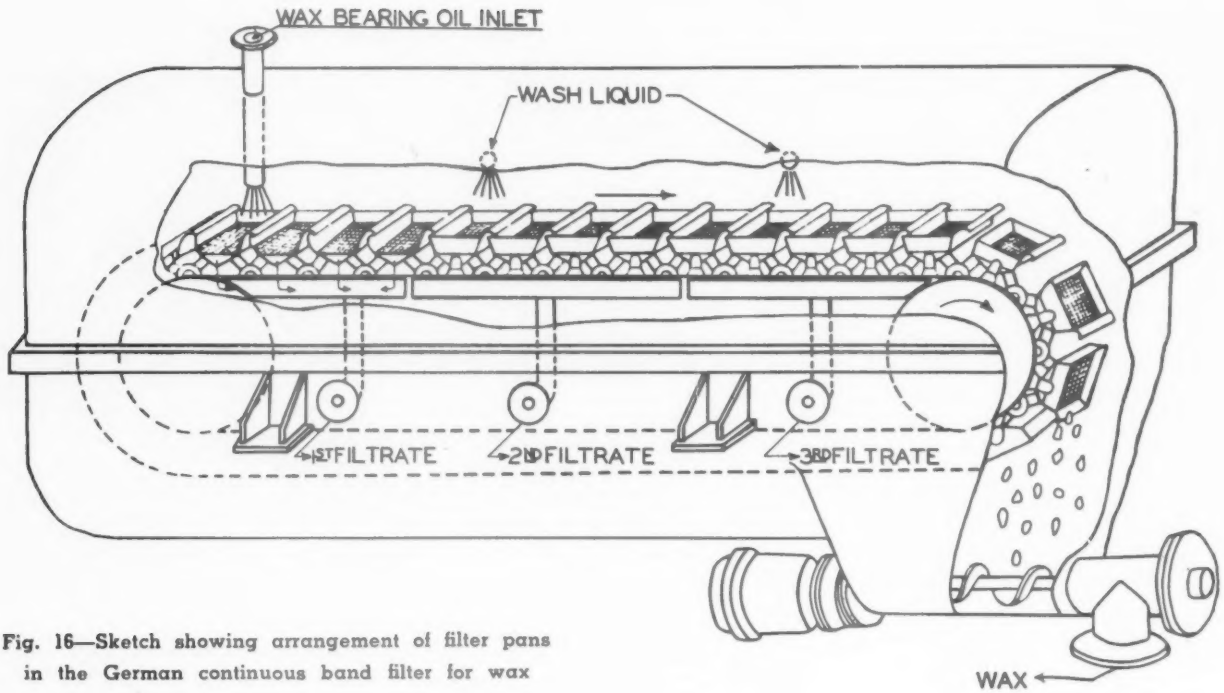


Fig. 16—Sketch showing arrangement of filter pans in the German continuous band filter for wax

Germans Invented Continuous Band Filter To Produce an Oil-Free Hard Wax

By J. PAUL JONES, Member U. S. Technical Oil Mission to Germany

Article 4 *in the Series—Some Solvent Extraction Developments in Germany*

Plans and drawings for an entirely new type of commercial wax filter were discovered in a confidential report of the manager of the German Edeleanu company, by a team of the Technical Oil Mission to Germany. First published description and drawings of the filter are given in the accompanying article.

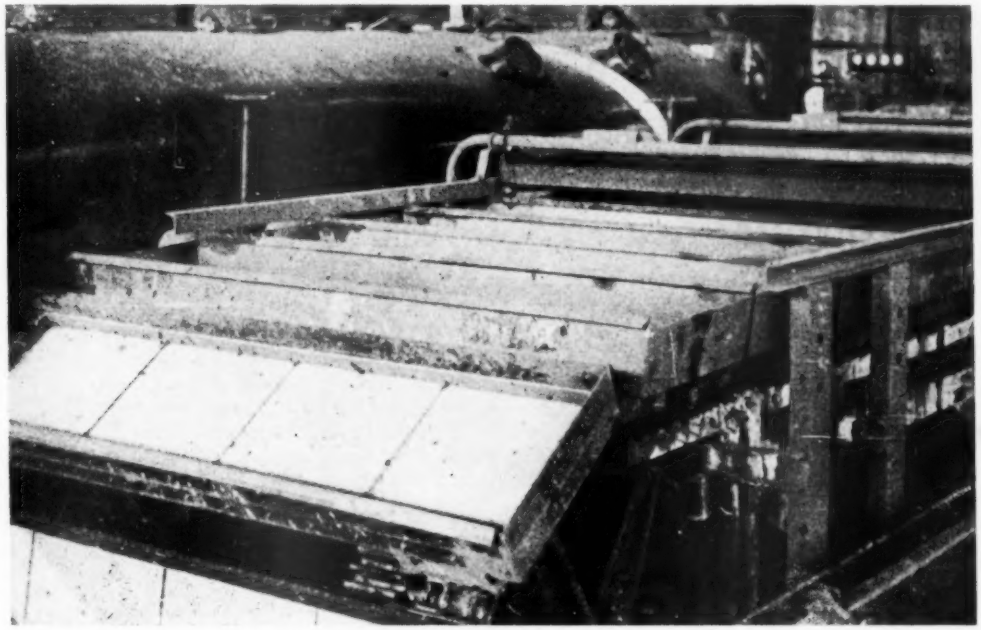
This continuous band filter was developed by the Germans to meet the wartime need for a commercial grade of hard wax substantially free from oil. The wax slurry was treated with one or more portions of solvent, the liquid being removed by suction from the bottom of moving pans. The entire filter was enclosed in a pressure shell.

The German Edeleanu organization also developed a supplementary straight-line graph method for recording and evaluating data from the solvent extraction of oils. This method was found to supply information on raffinate and extract solutions not obtainable through the more familiar triangular coordinate system discussed in earlier articles in this series. The straight-line graph method is described in this concluding article of the NPN Technical Section series on Solvent Extraction Developments in Germany.

IN ORDER to produce a hard wax with a low-oil content it was found desirable by the German Edeleanu organization to design a new type continuous filter. This was developed in cooperation with Maschinenfabrik Buckau R. Wolfe A. G., Magdeburg, 82/84 Schonebecker Strasse.

The filter consisted of a series of individual filter pans attached to an endless chain travelling along a horizontal path, as shown in Fig. 16, and the accompanying photograph. This was called a continuous band filter (Bandzellenfilter). Each filter pan had a horizontal filter surface, and the space underneath the filter surface was connected to a source of suction through a hollow shoe sliding along a hollow rail (See Fig. 17) and pressed down against the rail by a spring.

As any single pan travelled horizontally from one end of the filter to the other it received a charge of wax-oil solvent slurry,



The continuous band wax filter used at the A. G. Sachsische Werke at Espenhain. In the foreground is a filter unit with cover removed showing individual pans; in the background the pressure shell of a second filter unit

the liquid was removed by suction, and one or more portions of solvent were introduced, with the resulting liquid being drawn off. By the time the pan reached the end of the horizontal path the wax had been washed substantially free from oil. The pan then passed around the end sprocket wheel and the wax cake was blown out by blowing air (or an inert gas) through a short hollow rail and the same hollow shoe.

The wax was removed through a screw conveyor and the empty pan travelled back for further use. The entire filter was enclosed in a pressure-tight shell, with the interior maintained at about 1.1 atmospheres pressure, absolute. If air was used to blow the wax cake free from the filter pan it was recycled in a closed cycle. The last wash liquid was used as solvent for the initial wax-oil mixture.

The drawing in Fig. 16 is a cut-away sketch of the filter used at Espenhain, where six separate units were in service. Fig. 17 is generally illustrative of the type filter pan used at this same plant. There were 40 individual pans per filter unit, each about 0.43 meters wide and about 1.84 meters long. As a result there were 17 filter pans in use at any time, and the linear speed was about 1.5 meters per minute.

Four units of an improved version of this filter were installed at an underground lubricating oil plant at Porta, near Minden, known as Dachs I. This plant never operated and was designed for use with natural petroleum. The individual filter pans were 3.6 meters by 0.5 meters. The filtrate was drawn off through two conduits, as illustrated in the right hand portion of Fig. 17. In this model the weight of each filter pan was supported by two sliding shoes. There were 40 pans in each filter, with 16 to be in use at any one time. The linear speed was to be 0.0073 to 0.0442 meters per second, or 0.442 to 2.652 units per minute, with the end sprocket wheels turning at 0.117 to 0.702 RPM. A diagrammatic sketch is shown as Fig. 18.

The surfaces of the hollow rails and of the shoes which slide over them are sufficiently well machined so that, when lubricated with a suitable heavy oil, an effective seal is formed. The blanks between sections of the hollow rails are longer than the effective length of a shoe, and the space between two adjacent shoes is covered by a leather section which effectively seals the intervening space.

Catalytic Cracking of Diesel Oil

Shortly before the war some laboratory scale experimental work had been carried out on lowering the pour point of diesel oil by a mild catalytic cracking. The charge stock contained 5 to 8% wax and had a pour point of 41 to 45° F. This was passed at about 30 to 50 atmospheres pressure and 752 to 770° F. (not higher

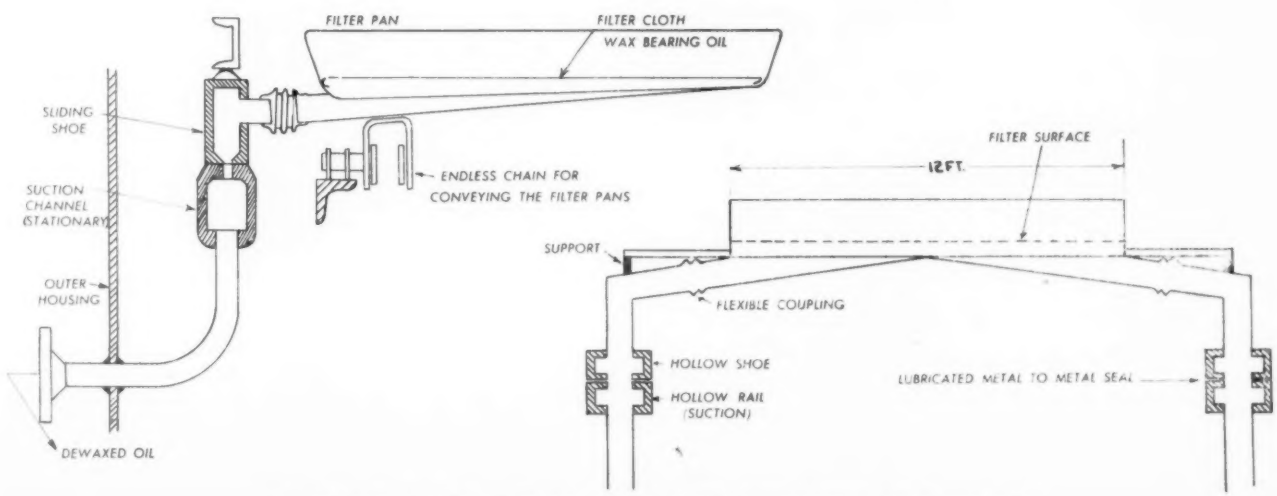


Fig. 17—Cross-sectional sketch of the German continuous band wax filter

than 788° F.) over a solid catalyst with a contact time of about 30 minutes to one hour. The product had the following approximate composition.

Gasoline	10%
Diesel Oil	85%
Residue	5%

No normally gaseous products were produced. The gasoline had an octane number of about 40 to 45. The diesel oil had a cetane number of about 60 to 65 and a pour point of about 14 to—4°F. The residue was a very good pour point depressant.

Two catalysts were used. The first was granular bauxite, impregnated with 5 to 10% of potassium hydroxide, prepared by soaking the bauxite in a 20% aqueous solution of the hydroxide. The other consisted of equimolar proportions of solid sodium and calcium hydroxides,without any carrier. It was stated that a good catalyst life was realized. At the start of a run the activity of the catalyst decreased a little, and then remained constant for quite a while.

Straight-Line Graph Method For Evaluating Data

Hunter and Nash° have previously shown how to record and evaluate data from the solvent extraction of mineral oils in isotherms on triangular coordinates. This method of presentation gives the following information for a given extraction temperature:

(a) Composition of particular extract and raffinate solution (as to solvent content) for a given charge stock.

(b) Densities of the resulting raffinates and extracts.

(c) The amounts of raffinate and extract solutions and the yields of each.

(d) The best raffinate (with lowest density) and the best extract (with highest density) and the corresponding yields, obtainable in a multistage extraction.

(e) The amount of solvent required for such a multistage extraction.

(f) The number of stages which must be used for the extraction either at a constant temperature or at several temperature levels.

Such a representation on triangular coordinates gives no information as to the composition of an oil with reference to its refinability. Also it does not give any means of directly comparing different charge stocks on the basis of their paraffinicity, nor does it give a direct method of comparing the possibilities of various solvents, nor any information pertaining to the possible uses of temperature gradients.

The Edeleanu research workers found a valuable supplement to the triangular coordinate system of presenting data, which answered all the above questions; but which, however, did not give an indication of the amounts of solvent used nor of the solvent contents of the raffinate and extract solutions.

°Hunter and Nash: "A Study of the Principles of Solvent Extraction", *World Petroleum Congress*, Vol. 2, 340-351 (1933). Hunter; "Theoretical Principles of Solvent Extraction", *Science of Petroleum*, Vol. 3, 1818-1828 (1938).

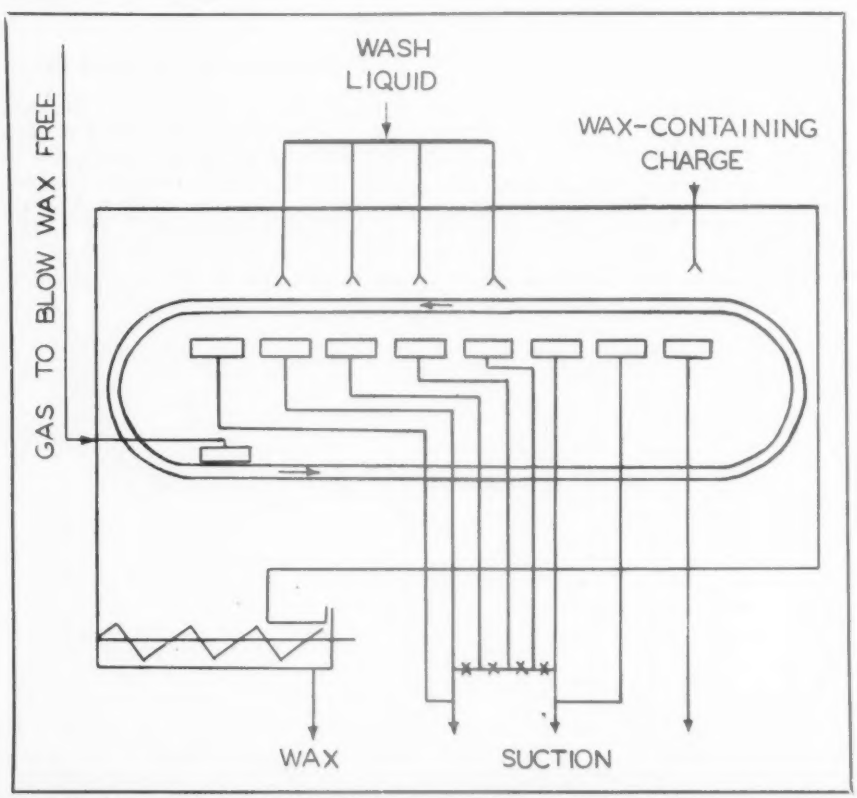


Fig. 18—Diagrammatic sketch of the improved version of continuous band wax filter installed at Porta

The information obtainable by the supplementary method can be briefly summarized as follows:

(1) If the respective densities, or the viscosity-gravity constants, of the raffinate and extract for each stage are plotted as ordinates and abscissae, or vice versa, on a rectangular coordinate system, a straight line will result (i.e. such as any one of the lines in Fig. 19).

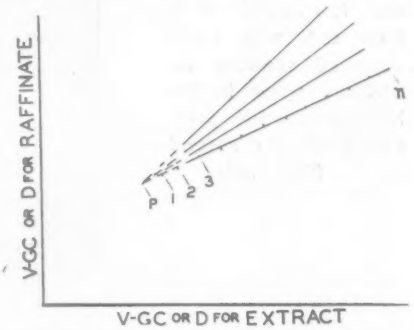


Fig. 19—Results of solvent extraction of an oil distillate, as shown by the straight-line graph method

(2) Such a line will have a different slope for every charge stock, depending upon its content of paraffin, naphthene, aromatic, and olefin hydrocarbons, and an indication of the paraffinicity of the charge stocks is given by this slope, when using the same extraction conditions with different oils.

(3) The lines resulting from plotting data obtained from the use of the same solvent with a given oil, at different temperatures, all intersect in a common point (See Fig. 19).

(4) The lines resulting from plotting data obtained from the use of different solvents with the same oil intersect in that same point.

(5) As a result of this clear and simple method of representation the various solvents can be directly compared with each other.

(6) The effect of the use of a temperature gradient can be readily recognized and evaluated.

(7) This common point of intersection, through which all their extraction lines pass, makes it possible to establish which is the best raffinate (i.e. with the best possible index value) that it is possible to obtain from a given oil.

(8) These straight lines give an insight into the composition of a given oil which can not be obtained by fractional distillation, nor fractional extraction, nor by other analytical data.

This knowledge, that such straight lines on a graph could be so obtained, induced the Edeleanu organization to evaluate in the same way data which had previously been obtained for other purposes and to verify and amplify the conclusions with systematic new research. This occupied the entire time of the organization after 1939. The benzene —SO_2 extraction apparatus at Courchelettes, France, with a capacity of about 65 metric tons a day and used since

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Lion Oil Company, of El Dorado, Arkansas, has contracted to construct the 70th Houdry-licensed cat-cracker, a TCC unit of 4500 bbl. fresh-feed capacity, with additional capacity for recycling. It will process sour stocks of wide boiling range, over synthetic catalyst.

Naturally, in planning this major post-war improvement, Lion considered the merits of all catalytic cracking processes. Weighing heavily in favor of TCC were:

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The small TCC unit is not an engineering "guinea pig," but a well-proved design which has been engineered from the ground up, with the same basic design features of the larger commercial TCC plants. Economics, not expediency, have guided its basic planning—have made TCC the catalytic cracking process most favored by operators of small refineries. In cost per ton of steel used in construction, in cost per barrel of high-octane gasoline produced and by other equally decisive standards, the small TCC unit will compare favorably with the catalytic cracking operations of major companies. Details will be furnished gladly to interested refiners.

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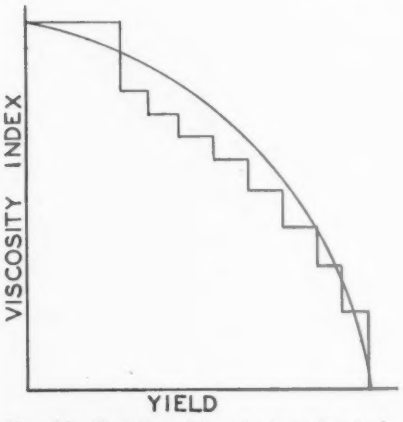

Fig. 20—Relationship of viscosity index to yield

1936, was employed with a different arrangement to find the answers to various questions using an Iraq oil. In addition, experiments have been carried out with a lubricating oil distillate from Zistersdorf, Austria, and a paraffin cut from a Persian oil.

When experiments are carried out using the same solvent and extraction conditions, but with different charge stocks and the results are plotted as herein before described, the slope of the lines will be an indication of the paraffinicity of the charge stock. The steeper the line the more paraffinic is the oil.

Fig. 19 shows diagrammatically the lines which are obtained when working with one distillate as an extraction charge stock. If this charge is extracted at the same temperature with varying amounts of each of several solvents the results for each solvent will fall along one of such a group of lines. The fact that all all of these lines cross at a common point of intersection shows that this point represents the best possible raffinate obtainable from this charge stock. The point can never be actually obtained experimentally but it can be more closely approached with a charge stock having a low content of paraffin hydrocarbons than with a charge stock having a high content of paraffins.

The solid lines are in a range which it is possible to cover experimentally and the broken lines are extrapolations. A similar group of lines is obtained by extracting a charge with the same volume of each of several solvents at varying temperatures. The common point of intersection will be the same as obtained with the first group.

The big advantage of this system is that the common point of intersection (which represents the best possible raffinate) can be determined from four experimental runs to obtain two experimental points for each of two lines. Thus, the use of two different volumes of solvent for extraction at the same temperature will establish one line and similar use of another solvent will establish a second line, or use of the same volume of a solvent at two different temperatures will also establish one of the lines.

Straight lines, such as just discussed, are obtained only from extractions of a distillate. If the material being extracted is a residual fraction the lines will be straight for only a part of the distance from the common point of intersection, after which they will curve upwardly. The intersection point for such materials can be determined only by making a sufficient number of experiments to ensure that the data are in that part of the line which is straight.

It was further stated by the Edeleanu representatives that it is possible by this graph method to determine the composition of an oil from any extraction line which passes through the common point of intersection, P. Such a line is divided into equal divisions, beginning with point 1. For each of these points the relative amounts, in percent, of raffinate and extract can be determined. As the basis for this study is the assumption that the raffinate and extract for Point 1, for example, have been produced by a separation of the raffinate from Point 2, and likewise the raffinate and extract for Point 2 have been produced from the raffinate of Point 3, etc.

Since the entire series starts with point "N" (highest density for an extract) and has developed from this first point to this latter extract and associated raffinate, it is possible to calculate for each point the amount of extract and raffinate as percent of the charge stock. Also, since all raffinates (up to the point P) are subjected to still further separations the composition of the charge stock can be obtained by adding to this raffinate, in proportional parts, the extracts corresponding to each differential of the line. If, on the basis of other data, the relationship of density to viscosity index is known for the same oil, it is possible to determine what relative amount of material of each viscosity index can be determined for each given amount of raffinate.

In Fig. 20 is shown such an analysis of an oil as a zig-zag line; the smooth curve represents the relationship of viscosity index to yield which has been determined from the relationships of density to yield. Such an analysis of an oil can be made when the initial lines (Fig. 19) are drawn with either density or viscosity gravity constant as the basis for the coordinates.

Optical Method For Determining Wax Content of a Wax Oil Mixture

A method was developed for determining the wax content of a wax-oil mixture containing about 20 to 60% of wax. This is done by measuring the amount of polarized light which will pass through a thin layer of the mixture.

The analytical method is based on the fact that wax crystals are doubly refractive while, on the contrary, oil is not. The determinations are made by using a small electric light (e.g. 6 volts, 5 amperes) as a source of light, passing the light through a collimating lens to make the rays parallel, through a red filter (because light of long wave length gives the best results), through a water filter (to absorb heat rays), through a Nicol prism(or other means of polarizing light), and through an iris adjusted to give a spot of light about 4 mm. in diameter. The light is then passed through a thin layer of the wax-oil sample, through a second Nicol prism (or other means of neutralizing polarized light) and then is measured by a photoelectric element, preferably one which is arranged to give readings on a scale having 100 divisions.

The wax-oil sample can be conveniently measured on a miscroscope slide such as is used for making a blood count, preferably one with a chamber 0.100 mm. thick. This slide is warmed, a drop of the liquefied wax-oil mixture is placed in it, the chamber is covered with a coverglass which is securely clamped, and the wax is allowed to crystallize. It is then brought to a standard temperature as by being placed in a water bath at 20° C. for about 5 minutes.

It is then placed in the apparatus and two measurements are made: (1) with the Nicol prisms crossed to establish the amount of double refraction due to the wax-sample, and (2) with the Nicol prisms parallel to establish the turbidity of the sample. The source of light should be so adjusted that the photoelectric element registers between 70 and 90 on the scale when the Nicol prisms are parallel. In the range of 20 to 60% wax content the ratio of the scale reading for crossed prisms to the scale reading for parallel prisms is proportional to the wax content.

With a mixture having a higher content of wax, the mixture can be diluted with oil or a chamber is used with a thickness of 0.050 mm. If the mixture has a lower content of wax a chamber should be used with a thickness of 0.200 or 0.500 mm. and a lower standard temperature, such as 0° C., should be chosen. It is recommended that calibration curves be drawn for each type of wax, by making measurements of mixtures made by adding known amounts of wax to an oil of low pour point.

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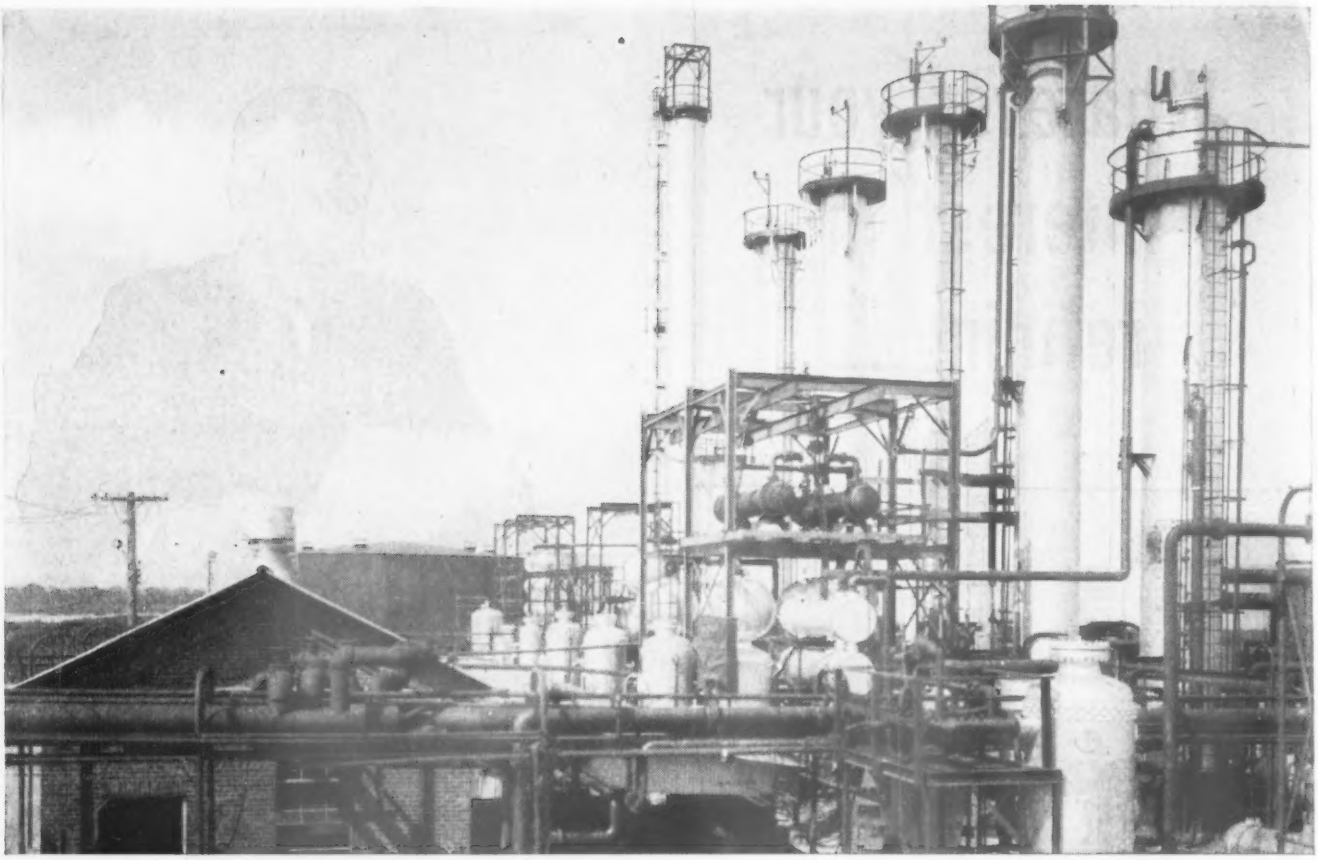

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Electric Welding Built A Wartime Refinery

By E. G. Woolman

Assistant Mechanical Superintendent
Cities Service Refining Corp.

500 miles of oil-transfer lines were built in the Lake Charles refinery, the majority of it welded

Improved techniques in electric welding came out of the war, born of men working both against shortages of materials and parts and against time in the industrial plant construction program in this country. Many of these new methods will become standard practice in new construction and maintenance work at refineries.

Outstanding example of a modern refinery in which new welding techniques were employed is the Tutwiler plant at Lake Charles, La. of Cities Service Refining Corp. Among other construction achievements here 500 miles of oil transfer lines were laid, the majority of it welded, and in the two years the refinery has been in operation not a single failure due to faulty welding has been reported. During plant construction 500 welders were employed and the refinery now maintains a staff of 25 welders for maintenance and construction work.

The assistant mechanical superintendent of Cities Service Refining Corp. tells in the accompanying exclusive NPN Technical Section article of the welding construction program at the Tutwiler refienry.

THIS refinery, which has now been in operation for two years, employed 500 welders during its period of construction and approximately 90% of all welding done on the job was electric arc welding.

The entire project includes a total of 2,500,000 linear feet of pipe, or roughly 500 miles, the majority of which were welded. Since the refinery has been in operation there has not been a failure due to faulty welding. However, due to the large number of lines handling caustic, acid and other corrosive products, there has been the usual amount of line breaks but considerable improvement has been effected in repairing or replacing these lines by employing alloy electrodes.

The refinery maintains a staff of 25 welders to handle its welding maintenance problems and to engage in new construction; they use Lincoln electric-driven 300-amp. welders.

In building the refinery's two topping units, which have a capacity of 80,000 b/d of crude, two crude towers, each 19 ft. by 90 ft. by 21/32 in. and two stripper towers, 9 ft. by 19 ft. 6 in., were erected, using two rings of two sheets each 5 ft. 4-1/2 in. high by 25 ft. 3 in. long by 11/16 in. thick, and ten rings of two sheets each 7 ft. 10-1/2 in. high by 25 ft. 3 in. long by 21/32 in. thick. (*See Fig.* 1). The field assembly consisted of six arc welded rings. Piping in these units ranges from 2-in. to 24-in. and is 100% arc welded.

The two furnaces used in the topping process, each containing 180 tubes, 60 ft. in length and 6 in. in diameter, were welded from 30-ft. lengths and stress relieved at the job site.

The refinery has three Fluid Catalytic cracking units consisting of three regenerators, 42 ft. 6 in. by 73 ft. by 1 in. at the shell, with 1-1/4-in. cone. Each shell has five rings of nine sheets to a ring, each 7 ft. high by 14 ft. 11 in. long and 1-in. thick. The first ring of the bottom cone has 18 gores, each 1-1/4 in. thick and the bottom ring has 12 gores 1-1/4 in. thick. The 6-ft. shell rings were field assembled and the cones were assembled from various segments.

The three reactors have 23 ft. by 47 ft. by 1-3/8-in. shells, and the cones are 1-29/32 in. The shells consist of six rings of five sheets each, each sheet measuring 7 ft. 10 in. high by 14 ft. 5 in. long and 1-3/8 in. thick. The bottom cone has two rings; the first ring consisting of 10 gores 1-29/32 in. thick, and the bottom ring 4 gores of the same thickness, with a bottom opening of 62 in. inside diameter. The 6-ft. rings were field assembled by arc welding.

Three fractionating towers, 16 ft. by 85 ft. with 13/16-in. shell and 7/8-in. cones, are also provided. Each shell is composed of ten rings of two sheets each. Five rings have sheets 6 ft. 10-1/4 in. high by 25 ft. 3 in. long and 13/16-in. thick, and the other five rings have sheets 8 ft. 3-1/8 in. high by 25 ft. 3 in. long and also 13/16-in. in thickness. The top and bottom heads are 15/16-in. thick with 12 gores each. The three sketches designated as Fig. 2 illustrate the methods used in welding the girth seam, vertical seam and head seams of these units.

The catalyst-carrying lines vary in size from 30 in. to 78-1/2 in. in outside diameter. The pipe sections are rolled plate with longitudinal shop welds and the breakdown is given in Table 1.

The insuline pipe was shop fabricated and insulining was installed by Baldwin Hill at its Trenton, New Jersey shop.

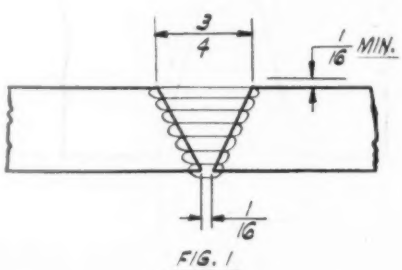


FIG. 1

Welding detail of crude tower topping units

TABLE 1—Breakdown of Pipe Sections for Catalyst-Carrying Lines

C-8	78½ in. O.D.	pressure pipe ¾-in. wall thickness
C-9	46½ in. O.D.	pressure pipe ⅜-in. wall thickness
C-12	42½ in. O.D.	pressure pipe ⅜-in. wall thickness
C-21	54½ in. O.D.	pressure pipe ⅜-in. wall thickness
C-11	30 in. O.D.	pressure pipe ⅜-in. wall thickness
C-10	37 in. O.D. by ½-in. wall thickness	
PA-6	42½ in. O.D. by ⅜-in. wall thickness	
PA-7	34 in. O.D. by ⅜-in. wall thickness.	

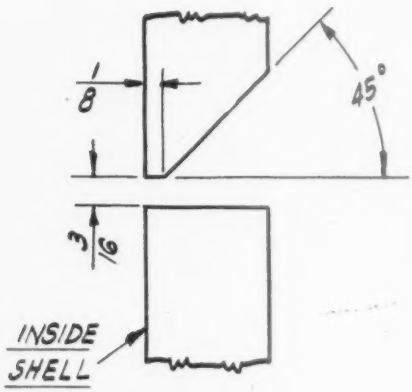


FIG. 2A

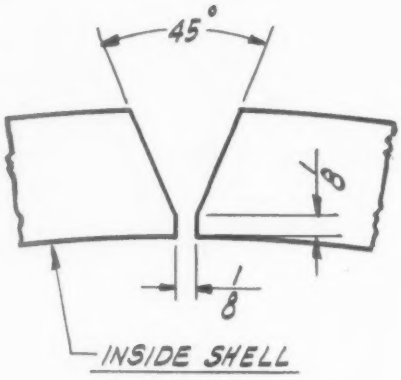


FIG. 2B

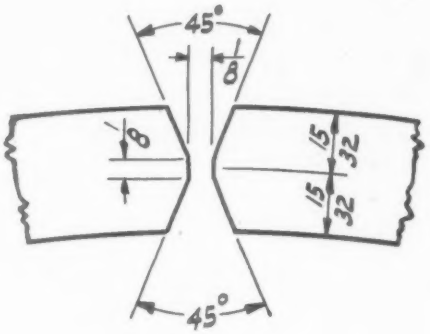


FIG. 2C

Fractionating tower welding detail showing girth seam (left), vertical seam (center) and head seams (right)

Many miles of all size oil and auxiliary piping were also field fabricated. All welds on the regenerators and reactors were subjected to X-ray inspection. Most of the internal piping in the regenerators was of stainless steel and was welded with stainweld electrodes.

Fig. 3 shows a typical field connection detail.

There are two alkylation units. One unit has an isobutane tower 13 ft. 6 in. by 114 ft. 6 in.; the top half is 1-5/32 in. thick and consists of four rings of 11 ft. 8 in., and one ring 10 ft. 10 in.; the bottom half is 1-15/64 in. thick and has three rings 11 ft. 8 in., one ring 10 ft. 7 in. and one ring 10 ft. 10 in. The tower has basket heads 1-11/32 in. thick. The other alkylation unit has a debutanizer tower same size as tower above.

The debutanizer tower is 7 ft. by 67 ft. by 21/32-in. shell with 9/16-in. elliptical heads. There are three rings of 11 ft. 4 in. and three rings of 10 ft. 10 in.

In piping the nine 10 ft. by 45 ft. sulphuric acid reactors and the three 8 ft. by 30 ft. caustic settlers' lines, from one inch to twelve inches were welded wherever possible to eliminate any possibility of leaking joints.

The debutanizer tower is constructed identically as the isobutane tower.

The refinery's thermal reforming unit is a combination tower 12 ft. by 100 ft. by 1-3/8 in. at the head. Fourteen rings compose the shell, seven of them having sheets 7 ft. 1-1/4 in. high by 1-3/8 in. thick and the other seven rings with sheets 7 ft. 1-1/4 in. high by 1-3/16 in. thick. The top head is elliptical at two to one ratio and is 1-3/16 inches

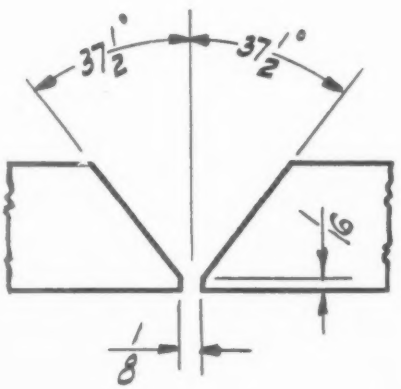
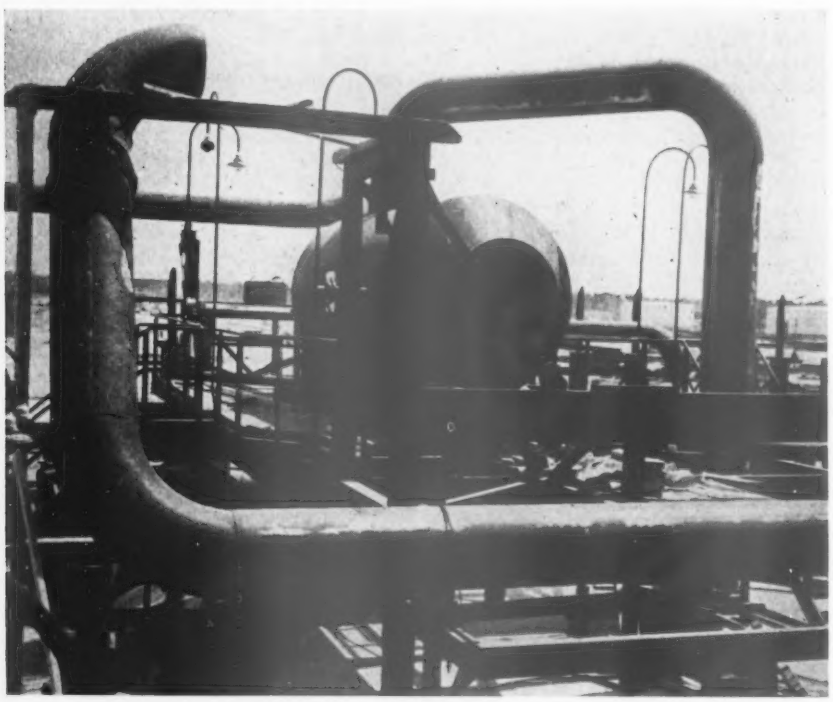


FIG. 3

Typical catalyst field connection weld detail



Preheated air at 15 psi pressure is supplied to the Fluid Catalyst Unit regenerator through this 10-in. pipe, shown as it was being field welded in place on top of the compressor house. Shown in the background is the partially installed air preheater. This 8 ft. by 18 ft. heater, which was shop-fabricated, is gas-fired, has a 12-in. fire-brick lining

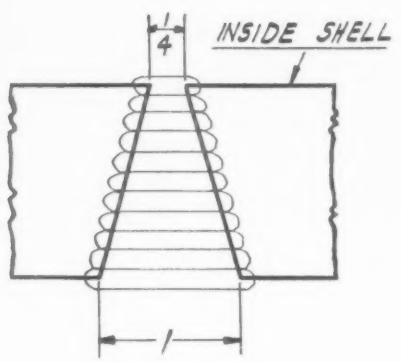


FIG. 4

Sketch showing detail of girth seam No. 7 of thermal reforming unit tower

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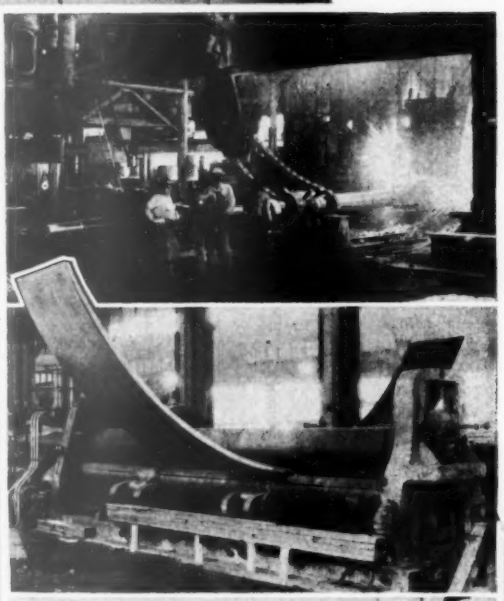

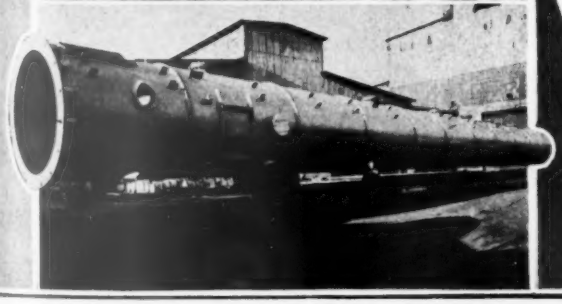

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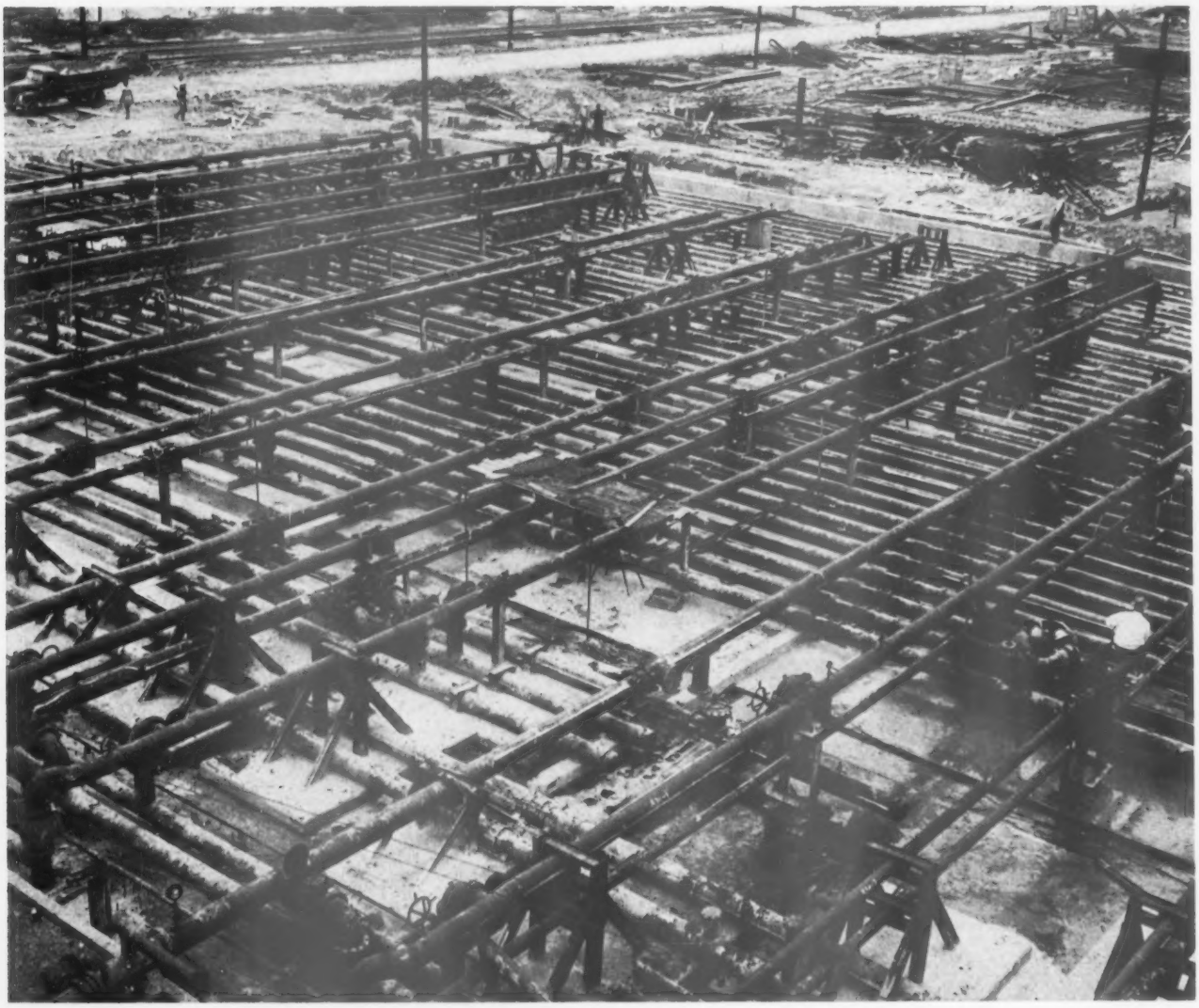

This pump-station products transfer manifold is largest in Cities Service's Tutwiler Refinery. All piping visible was field-fabricated in place by arc welding; only bolted connections are for valve fittings, certain tees and where flexible couplings are required to dampen vibration or to allow for expansion-contraction stresses. Pipe is 12-in. mild-steel, 0.035% carbon

thick and the bottom head has the same ratio and a thickness of 1-3/8 in. Fig 4 shows detail of girth seam No. 7.

The thermal unit furnace has 180 six-in. tubes 60 ft. in length. Welding detail is shown in Fig. 5. These tubes were welded in the field from 30-ft. lengths and stress relieved at the job site.

About 500 miles of oil transfer piping used in the general yard piping setup, ranging from 4 in. to 20 in. and including the manifolds in the four large pump stations, were fabricated in five separate fabricating shops and hauled to location for welding assembly. Inasmuch as the project was erected during wartime, it was necessary to fabricate a large portion of the ells, tees, crosses and other pieces of this type, since manufactured fittings were unavailable. The units' sixteen pressure storage spheres and spheroids vary in size from 2,500 bbls. to 25,000 bbls., and were constructed by The Chicago Bridge and Iron Works.

Underground process water piping from the water pump house to all processing units ranges in size from 12 in. to 48 in. and also was welded.

The power plant facilities consist of two 25,000-kw. turbo generator units supplied from two high pressure boilers with a pressure of 850 lbs. of steam, plus six low pressure boilers of 250 lbs. of steam pressure for processing and unit prime movers. All steam pressure piping was weld-fabricated in the field.

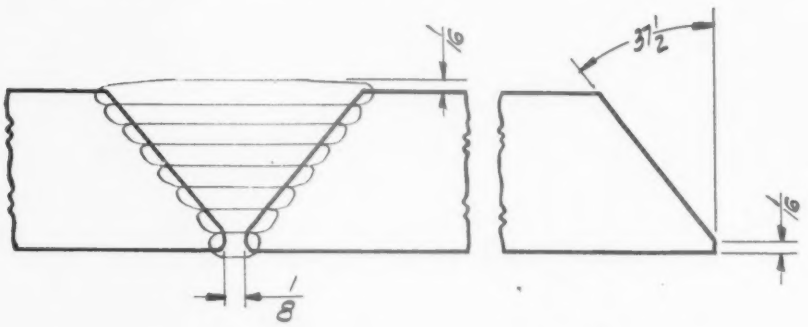

FIG. 5A FIG. 5B

Sketch showing weld detail of thermal reforming unit furnace tubes

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Navy Plant Salvages Two Grades of Fuel Oil From the Sludge from Tank Cleanings

Valuable fuel oil is recovered from tank bottom sludges, in a method developed by the Navy, by first settling followed by a series of heating and settling treatments in specially equipped tanks. Depth tests for bottom sediment and water, taken after settling, determine the extent to which specification oil can be skimmed from the top layer in the tank. Free water is drawn from the bottom. Research work has determined that chemical treatment of the charge of sludge to the heating tanks improves the recovery of the oil. The cost of chemicals is an economic factor, however.

THE oil reclaiming plant of the Navy at Craney Island, at the Norfolk, Va., naval base, operated by two men, had recovered 175,000 bbls. of fuel oils, in two years up to last November, from a total plant throughput of 450,000 bbls.

Receipts to the plant are contaminated Navy Special and Grade II boiler fuel oils and Navy Diesel fuel oil, included in ship bunker tank cleanings, tanker and barge cargo tank cleanings, bottom sediment from shore tank fuel oil storage and accumulated waste and off-test fuel oil.

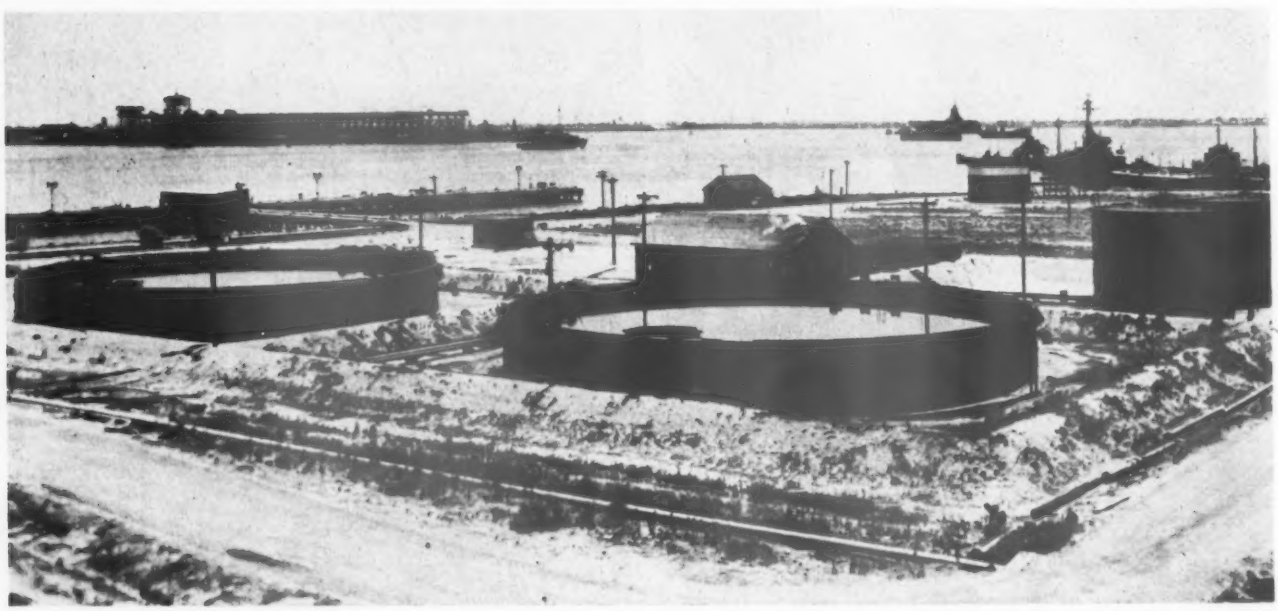
The treatment includes (1) settling for 24 hours to enable specification oil to rise to the top of the sludge and be skimmed off and free water to be drawn off the bottom; (2) heating the remaining sludge and, after settling, skimming specification oil to storage and drawing off free water; (3) reheating the "interface" of sludge remaining from previous treatments and skimming the good oil to storage.

Contaminants in the sludge, in addition to fresh and salt water, are petroleum decomposition products such as finely divided carbon and tarry material, paint scale, rust and silicious matter, which are retained in the oil both by emulsification and physical entrainment. The contaminants are eliminated durinng the recovery process as far as possible by running them into the river as soon as completely oil free.

In some instances, however, complete elimination of the oil is not possible, especially when the solids content is high, and this refuse cannot be run into the river without contaminating the water. This material, an average analysis of which is 87% water, 10% solids and 3% oil, is pumped to a large open deballasting area where the water evaporates and the solids and oil bond with the sand to yield a well stabilized surface.

Receipts to the Craney Island plant of Navy Special fuel oil are segregated as completely as possible, to allow the recovery of the maximum amount of this grade, the more valuable of the two grades of fuel oils. Other receipts, the oil constituent of which is Grade II, off-color Navy Diesel, or any mixture of the three grades, are processed to recover an oil meeting Grade II specifications. The Navy Bureau of Ships policy dictates that Navy Diesel, which tends to produce sludge in admixture with boiler fuels, shall not be mixed with Navy Special grade. Hazy or off-color Navy Diesel that is salvable as such is handled separately and is not included in the following discussion. Current specifications for the three grades of Navy fuel oil are given in Table 1.

Normal practice at the plant is to recover oil with a maximum of 1.2% B. S. and W. by centrifuge for both of the boiler fuel grades if the product is to be run to tankage which is to be drawn from for issue to ships. Oil of



General view of the oil reclaiming plant at Craney Island, Norfolk, Va., naval base. In foreground are the two open top settling tanks. Behind them is the pumphouse and recovered oil storage tank and, to the right, the two heating tanks. The oil-water gravity separator is behind the left settling tank and not in view. The reagent blending tank had not been erected when this photo was taken

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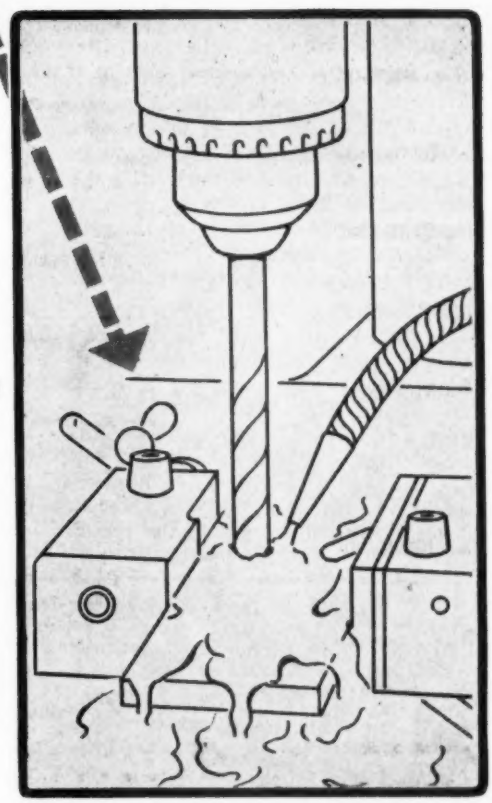

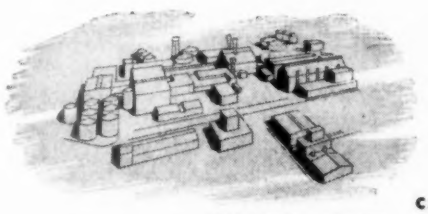

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this quality is run to field storage tanks containing enough oil of less than 0.5% B. S. and W. by centrifuge such that the resulting blend is still within specification. This practice increases the plant throughput considerably because of the subsequent decrease in settling time required.

In the event the outlet for the fuel is a shore power plant, a maximum of 5.0% B. S. and W. by centrifuge is set as the control. This material will run approximately 3.5% water by distillation and the apparent difference of 5.0 minus 3.5, equivalent to 1.5% solids, has been found to be practically 100% combustible and the ash will be within the specification of 0.12%, the maximum for ash for Grade II. This 5.0% fuel will not, as a rule, meet the sediment by extraction specification for Grade II, being of the order of 0.2%, but with the ash below specification, no undue deposition occurs in the firebox upon combustion.

The following equipment constitutes the Craney Island oil reclaiming plant:

Two Open-Top Settling Tanks: 15,000 bbl. capacity, 100 ft. diameter, concrete, with conical bottom, water pump, oil-skimming swing-line, water draw-off swing-line, extreme bottom suction, and fill line from dock.

Two Heating Tanks: 25 ft. x 30 ft. diameter, steel side-walls, wood roof, concrete bottom, equipped with oil-skimming swing-line, bottom suction, fill line, and steam heating coils.

One Gravity Water-Oil Separator: Concrete, 10 ft. x 18 ft. long x 9 ft. deep, approximate capacity, 1400 bbl. of water per hour.

One Recovered Oil Storage Tank: Concrete, 1600 bbl. capacity, with fill line, suction line, and low stripping line.

Pump House: Houses the main pumping unit, a 12 in. x 10.25 in. x 12 in. Worthington steam reciprocating pump, a 15 gpm Worthington electric motor driven rotary stripping pump, a 4.5 in. x 2.75 in. x 4 in. Worthington steam reciprocating pump for circulating during preparation of chemical additive and for metering in the additive during charging of the heating tanks for chemical treatment.

Reagent Blending Tank: 1760 gal. steel, with closed top, steam heating coils, conical bottom, low suction, and fill line.

Utility Pump: 7.5 in. x 7 in. x 10 in. Worthington steam reciprocating pump located at the gravity water-oil separator for returning the oil skimmed from the separator to the settlers and for miscellaneous transfers.

Pilot Plant: A 50-gal. steel drum equipped with try-cocks at 2-in. intervals, open and closed steam for heating, and an air line for agitation. Incoming sludges as well as in-process material are given heat and chemical treats in the pilot plant to determine the optimum temperatures and per cent chemical to be used in the large heating tank treats.

Centrifuge: Since the Bottom Sediment and Water by Centrifuge Method, F. S. No. 300.33, A. S. T. M. No. D96-40, is the operating control test for receipts, in-storage and in-process material and final product, the plant is supplied with a centrifuge machine so that on-the-spot tests can be run.

Laboratory: The Craney Island laboratory is equipped with a microscope for microscopic examination of sludges, facilities for determining closed cup flash, viscosity (SSU and SSF), API gravity, ash, sediment by extraction, and water by distillation. A complete laboratory where all specification tests are conducted is maintained at the Naval Operating Base for testing finished products.

At the beginning of an operation at the reclaiming plant one of the two settling tanks is designated as "Navy Special Settler" and the other as "Grade II Settler" and receipts of contaminated oil are consigned to the proper tank. The fresh sludge is allowed to stand in the settler for 24 hours to enable any loosely entrained water to settle to the bottom and specification oil to rise to the top. At the end of this detention period, depth samples are taken at depths such as 3, 6, 9, 12 and 15 ins. for B. S. and W. by centrifuge determinations.

Oil testing 1.2%, if the product being

TABLE 1—Specifications for Three Grades, Navy Fuel Oils

	Navy Special	Grade II	Navy Diesel
Flash, closed cup (min), °F.	150	150	150
Fire (min), °F.	200	200	...
Viscosity, at 122°F., (max), SSF	...	150	...
Viscosity, at 122°F., SSU	110-225	...	...
Viscosity, at 100°F., SSU	...	...	35-45
Ash (max), %	0.10	0.12	0.01
Water by Distillation (max), %	*0.5	*0.5	...
A. P. I. Gravity (min)	11.5	10.0	...
Pour Point. Upper (max), °F.	15	50	0
Carbon Residue (max), %	15	...	‡0.2
Sediment by Extraction (max), %	0.12	0.15	...
B. S. and W. by Centrifuge (max) %	0.5	...	trace
N. B. T. L. Heater	#1	#2 (or Better)	...
Explosiveness (max), %	50	50	...
Total Sulphur (max), %	...	...	1.00
Corrosion at 212°F., copper strip	...	...	Pass
90% Distillation Temp. (max), °F.	...	...	675
Color (max)	...	...	5
Ignition Quality (min), Cetane No.	...	...	50

* For deliveries by supplier's tanker or barge, oil containing water will be accepted at a reduction in price, provided the sediment by extraction does not exceed 0.15% or water does not exceed 1.5%

‡ Carbon residue, Navy Diesel on 10% bottoms.

produced is for ships, or 5.0%, if the product is for a shore installation, is skimmed to the storage tank, suction being taken through the oil skimming swing-line. Pump discharge samples are taken periodically for B. S. and W. determination so that the pump rate and skimming line depth can be adjusted to maintain the quality of the oil at the proper B. S. and W.

After skimming off the specification oil, the pump discharge is diverted to one of the heating tanks. The heating tank is filled to a depth of 20 ft. (2,500 bbls.), which leaves 5 ft. free-board for expansion. Steam is applied to the tank coils during and after charging to raise the temperature as rapidly as possible to 215 to 230° F., in which temperature range the sludge will boil and steam. When this point is reached, the steam is secured, and the contents of the tank are allowed to settle for 36 hours. Specification oil, the quantity of which is determined by depth samples, is skimmed by gravity to the storage tank. Settling is continued for an additional 24 hours, and the good oil again skimmed to the storage tank. Experience has shown that very little good oil will be produced until the temperature of the top layer of oil is below 160° F., and further, the entire production from a given batch will have been realized when the entire contents of the tank have cooled to below 155° F.

Any free water formed on the bottom of the tank is run overboard by gravity through the water-oil separator. Remaining in the tank is an "interface" of sludge which will average 60 to 65% B. S. and W. by centrifuge and will be approximately 4 ft. in depth (500 bbls). This material is combined with interfaces from previous heat treats and the combined material is reheated to a boil, settled, the good oil skimmed to storage, and free water drawn off in the same sequence as set forth above for the batch direct from the settler.

The dividing line between the specification oil and the interface in any treat conducted as above will be very sharp, the good oil being of uniform B. S. and W. down to within 3 to 6 ins. of the interface. Typical results from a heating tank after 36 hours settling are given in Table 2.

In this case, the swing-line was set at 186 ins., and the good top layer skimmed down to within 2 or 3 ins. of the high B. S. and W. material. In the settlers, where no heating is possible, the dividing line between the good and bad oil is not sharp, the B. S. and W. gradient being typified by the data in Table 3.

Seven inches of oil assaying 1.3% B. S. and W. by centrifuge was skimmed to storage from the above body of oil.

The depth of interface from a reheat of combined interfaces will be greater than that from a heat treat of fresh material. Also, the B. S. and W. of the top layer of oil above the interface will be higher due to a build-up of extremely fine solids in the recycle. Whereas the oil effluent from the first heat on the heating tank charge in the above example averaged 0.70%, that from the second heat on the combine interfaces from two heat treats on fresh stock averaged 1.5%. The interface from this treat plus an interface from another "fresh" treat yielded top layer oil of 2.5%; the fourth heat yielded 3.8% oil, and the fifth heat 7.0% oil. As pointed out above, the fine solids in the recovered oil are practically 100% combustible and do not contribute to ash. It should be pointed out, that although the B. S. and W. in the recovered oil increases with each additional recycle, the quantity of top layer oil decreases. This fact for the five above heat treats is illustrated in Table 4.

In the majority of cases there will be a free water layer on the bottom of the heating tank that can be run directly overboard through the water-oil separator. In some cases, however, the water is entrained loosely in the soft interface and can not be drawn off through the separator without contaminating the river. It has been found that by pumping the interface, either hot or cold, from one heating tank to the other against 25 to 30 psi. pressure will separate the

TABLE 2—B. S. and W. Gradient in Heating Tank after 36 Hours Settling

South Heating Tank, charged from West Settler: Tank bottoms from Lynn Haven, Fla., Navy Special storage. Avg. B.S. and W, 12.5%. Maximum Temp., 225° F.

Depth of Sample, Inches Below Top Surface of Liquid	B. S. and W. by Centrifuge, % by Vol.	Temp., °F.	Gravity 60/60°/F. A. P. I.
12	0.80	124	17.0
24	0.80	124	17.0
36	0.80	124	17.0
48	0.70	125	16.9
60	0.70	126	16.9
72	0.65	126	16.9
84	0.60	126	16.9
96	0.60	128	16.9
108	0.60	128	16.9
120	0.65	130	16.9
132	0.70	132	16.8
144	0.65	136	16.9
156	0.70	137	17.0
168	0.80	139	17.0
180	0.80	142	17.0
186	1.00	145	16.8
189	35.0	175	14.5
192	50.0	180	13.5
204	60.0	190	12.8
216	*65.0	195	12.5
228	*70.0	195	12.4

* Free water dropped out in sample bottle; B. S. and W. run on oil layer. No oil free water on bottom of heating tank.

TABLE 3—Typical B. S. and W. Gradient in Settling Tank

West Settling Tank; Tank bottoms from Lynn Haven, Fla., Navy Special storage.

Depth of Sample, Inches Below Top Surface of Liquid	B. S. and W. by Centrifuge, % by Vol.	Temp., °F.	Gravity 60/60°/F. A. P. I.
3	1.2	80	16.5
6	1.2	80	16.5
9	1.5	80	16.4
12	6.0	78	16.2
15	11.0	78	15.8
18	16.0	78	15.5
24	24.0	78	14.9
36	31.0	78	14.4

TABLE 4—Effect of Number of Heat Treats on B. S. and W. and on Volume of Oil Recovered

North and South Heating Tanks Heat Treating West Settler Tank Bottoms From Navy Special Storage, Lynn Haven, Fla. Maximum Temp. For All Heats. 215 to 230° F.

Heat Treat Number	B. S. and W. by Centrifuge of Top Layer Oil	Quantity Oil Net Barrels @ 60° F.	Water Over-Board, Net Bbls. @ 60° F.
First (South Heating Tank)	0.70	2,000	None
First (North Heating Tank)	0.90	1,500	None
Second	1.5	760	400
Third	2.5	300	500
Fourth	3.8	180	1,000
*Fifth	7.0	80	1,230

Average B. S. and W. of total recovered oil, 1.22%.

* Remaining from the fifth and final heat was a residue of 450 Net Barrels @ 60° F. having the following composition:
Water, 85 %
Solids, 12%
Oil, 3 %
This 450 bbls. was pumped to the deballasting area.

Productivity Index of seven major industries in comparison with averages for "All Manufacturing" (from Bureau of Labor statistics)

	1919	1925	1931	1937	1938	1939	1940	1941	1946
All manufacturing	58.0	86.0	107.3	119.6	121.8	132.4	138.8	142.7	?
Cement	60.2	86.0	119.4	124.5	128.7	139.4	138.0	149.8	?
Chemicals	41.5	71.0	112.7	126.6	124.3	138.7	133.0	*	?
Cotton Goods	85.0	96.3	94.0	136.6	137.0	146.1	155.6	161.6	?
Automobiles	42.7	74.2	94.6	119.3	118.4	118.8	120.4	*	?
Lumber and Timber Products	95.8	92.8	109.9	100.0	106.2	121.3	129.0	133.3	?
Petroleum Refining	49.4	93.2	116.7	167.1	177.3	193.4	200.0	207.6	?
Tobacco Products	68.1	83.6	112.1	145.2	152.8	161.9	162.3	166.7	?

* *Figures not available*

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It is not surprising that the petroleum refining industry has an outstanding record in increasing efficiency, reducing production costs, and improving product quality, for this industry has consistently made the greatest use of all available engineering assistance.

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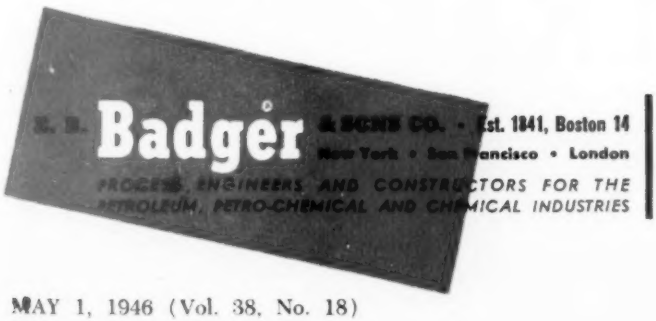
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3. Cracking of high-boiling hydrocarbons to manufacture gasoline.
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Navy Reclaims Oil

Operator taking a depth sample from the "Navy Special" open top settling tank for B. S. and W. by centrifuge determination

two phases with remarkable efficiency, such that the water thus dropped out can be run overboard. Most of the water recorded in Table 4 was eliminated in this fashion.

Extensive research and development has been conducted at this activity in the field of chemical treatment of fuel oil emulsions. A number of reagents have been tested that have proven to be very effective in that their use results in the following advantages:

1—Reduced quantity of recycle interface per treat.
2—Increased quantity of oil-free water.
3—Higher concentration of solids in the effluent water.
4—Lower B. S. and W. top layer oil.
5—Lower treatment temperatures (165 to 190° F. versus 215 to 230° F.)

In a chemical treat, the additive is metered in with the charge to the heating tanks, and the mixture is then handled the same as for a straight heat treat.

Sulphonated vegetable, petroleum, and neats-foot oils are the basic constituent for the majority of the demulsifying agents. The fundamental requirement for any agent is mutual solubility in oil and water or brine. Plant scale (2500 bbls.) treats have been made using "Mar-O-Oil," a sulphonated vegetable oil manufactured by Marrow's Inc., Chicago. This agent in admixture with acetone (the acetone promotes mutual solubility) gave excellent results with the advantages listed above. This particular agent is too expensive to compete with straight heat treats, but its use has resulted in much valuable data for use in the search of cheaper chemicals. It is believed that straight heat treats followed by chemical precipitation on the interface will be the eventual method for processing, such that the chemical costs will be balanced by the reduction in handling and heating costs.

Crude Desalting in Refinery Operations

By F. Duane Fuqua

Process Engineer, Ben Franklin Refining Co.

Presented before Western Petroleum Refiners Assn., Fort Worth, Texas, March 26, 1946.

The salt removal system at a Mid-Continent refinery with a 3000 b/d crude charging rate and utilizing various Oklahoma crudes, secures 90% and better salt removal, at a cost for chemicals of less than 2 mills per bbl. of crude processed. While the removal steps are of the conventional order, it is the close attention paid by the operators to several variable factors that enable the high degree of success in desalting to be achieved. These include:

Maintaining the proper pressure drop across the emulsifying valve.

Holding the most suitable temperature within the settler to break the emulsion.

Maintaining sufficient back pressure to prevent vaporization of the crude in the desalting system.

Close metering of fresh water to hold the desired concentration of brine in the settler.

Close control of the volume of chemicals used.

THIS paper has no intention of setting forth a cure-all salt removal method, as it is realized that the problems of crude oil desalting are widespread.

The method herein described utilizes well known fundamentals of salt removal. The results are satisfactory in that 90% and better salt removal is constantly obtained with a chemical cost of less than 2 mills per bbl. of crude processed. Throughout the discussion the word "salt" refers to the chloride content, whatever the positive radical may be.

It is well known that salt is responsible for a great deal of refinery corrosion and deposition in topping, cracking and exchanger tubes. Chlorides are particularly offensive since by hydrolysis they form hydrochloric acid which reacts with iron to form iron chloride. Hydrogen sulfide present in some oils reacts on the iron chloride forming iron sulfide and liberating hydrogen chloride which again attacks iron and the process is repeated.

Whenever salt-containing oils are evaporated the salt is precipitated, thus adhering to tube walls and progressively reducing the efficiency of heaters and exchangers both by decreasing heat transfer coefficients as well as substantially increasing pressure drop.

Most salt removal systems are similar in that they are integrated into essentially three main parts.

1. Introduction of water to the crude.
2. Emulsification of water and crude.
3. Demulsification of crude.

The greatest difference between systems is in the method for carrying out each step. The process utilized at the Ben Franklin Refining Co. refinery at Ardmore, Okla., as shown by Fig. 1, involves the introduction of a metered quantity of preheated water 5 pipe diameters from the suction of a reciprocating crude oil charge pump. Water used is from the discharge of the cooling water circulating pump which takes suction from a hot well that receives the hot effluent from several condenser boxes.

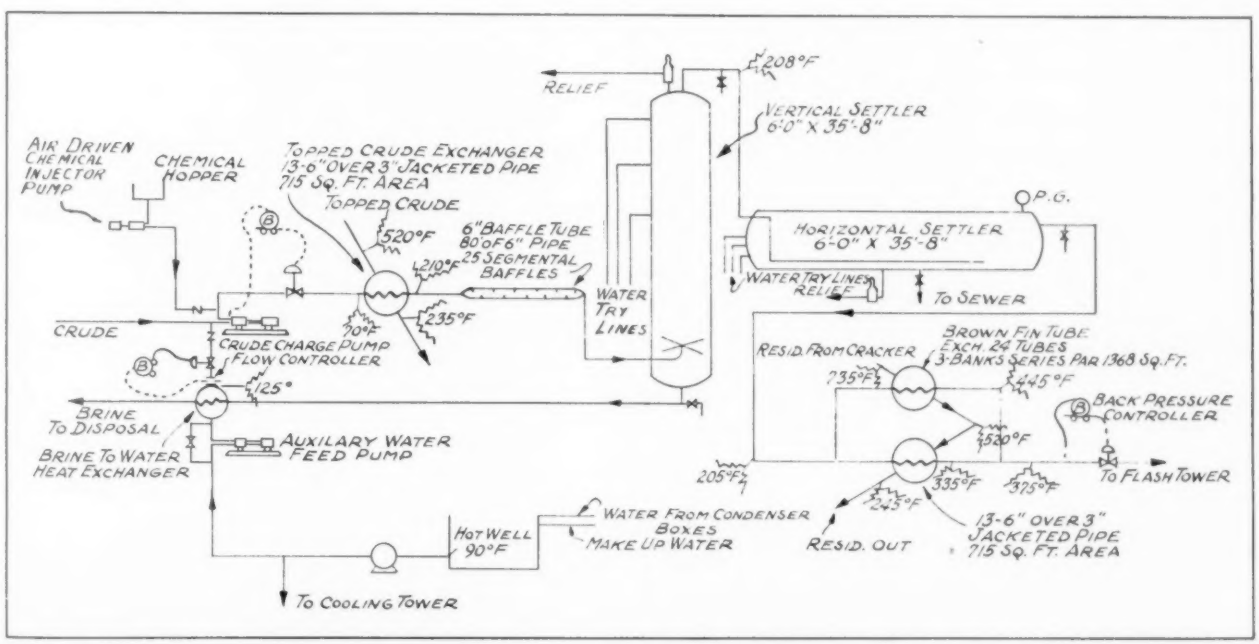

Fig. 1—Flow diagram for the salt removal process in use at the Ben Franklin Refining Co., Ardmore, Okla.

Make-up water to the hot well comes from a pond filled by surface water. The water has a relatively low hardness but often contains considerable amount of dissolved and suspended solids. The water circulating pump produces sufficient head to put the required amount of processing water through a brine to water exchanger and into the suction of the crude pump. However, should more pressure be desired, a small reciprocating pump has been provided.

An orifice has been installed on the water line and a flow control indicator allows the operator to know at all times how much water is being injected. Valves allow the water line to be blocked from the crude and by-passed to a barrel to permit calibration of the meter at regular intervals as a safeguard against orifice fouling or mechanical trouble within the flow indicator.

Although the water from the hot well is 90-100° F., the temperature of the water is raised to approximately 130° F. by heat exchange with the effluent brine which is drained to a spare tank until it can be disposed of.

Demulsifying chemical, as required, is pumped by means of an air-driven chemical injection pump into the crude 5 pipe diameters downstream from the crude pump discharge. Chemical rates are easily adjusted by length of pump strokes, speed of pump, and number of cylinders operated. The quantity of chemical is obtained by direct gauge from small hoppers. Operators are responsible for the quantity of chemical used and are at all times cognizant of the amount being used per shift.

Water emulsion is formed by passing the crude and water mixture through an air operated, double port, throttle type, back pressure control valve. The valve, with Fisher Wizard controller, is set to hold a given back pressure on the crude pump, thus controlling the amount of pressure drop required for emulsion.

Breaks Viscosity of the Crude

Next the emulsion passes through a topped crude to crude heat exchanger where sufficient heat is picked up to break the viscosity of the crude. Exchangers now being used for this service are thirteen 60 ft. lengths of 6-in. over 3-in. jacketed standard pipe connected in series. With 751 sq. ft. of external tube surface the mixture of crude and water is heated from 70° F. to approximately 210° F., while the 60-65% yield of topped crude is cooled from 520° F. to 235° F. Crude is piped through the tube side and topped crude passes through the shell counter currently.

Crude passes directly from the heat exchangers into a horizontal baffle tube. The baffle is fabricated of 80 ft. of 6-in. pipe with 25 slightly larger than semicircle segmental baffles welded into the pipe at regular intervals. Pressure gauge connections have been installed before and after the baffle, which may also be used for sample connections, or water or chemical insertion points (they have never been used as such during the course of this investigation.)

Center vessel is vertical settler of the salt removal equipment at the Ben Franklin refinery

From the outlet of the baffle tube, crude enters the bottom head of a 6 ft. x 35 ft. 8 in. vertical settler. The feed nozzle of the vertical ells up into the settler and terminates in a cross distribution header. The vertical vessel contains a perforated plate with 1-in. holes on 2-in. centers located directly below the top manway 6 ft. from the top of the vessel. The plate presently has no use, but at one time supported an excelsior packing which at the time proved to be worthless. Try cocks are located 20 ft., 24.5 ft., and 29 ft. from the bottom of the vertical vessel. A water level of approximately 20 ft. is maintained in the settler and crude is scrubbed counter currently with water breaking from the emulsion.

Hot water is drawn from the vertical settler and exchanges heat with the fresh water charge. The brine drawn off is hand controlled. Water washed crude passes from the top of the vertical vessel into a 6 ft. x 35 ft. 8 in. horizontal settler where additional settling time is afforded. Actually the horizontal vessel is in the system only as a safety factor.

Crude enters the horizontal vessel through a perforated distribution header which runs longitudinally the full length of the vessel; the header was originally intended for additional water scrubbing through a water level held in the horizontal settler. Crude outlet is on top of the head opposite the feed entry. Try cocks are provided on the horizontal drum, also water may be drawn from the bottom of the vessel to the sewer.

A pressure gauge on the outlet of the horizontal settler serves as an index for the back pressure that is held on the outlet of the further exchanger.

Crude from the horizontal settler is split through two exchangers where heat is picked up from cracking plant residuum. One exchanger is a Brown fin tube exchanger piped series of parallel 24 tubes—3 banks of 8 tubes, with 1368 sq. ft. of external surface—exchanging heat with hot residuum (735°-520° F.) directly from the cracking plant. The other exchanger is identical in construction with the topped crude to crude exchanger, i.e. thirteen 60 ft. lengths of 6-in. over 3-in. jacketed pipe with crude on the tube side and residuum effluent from the Brown exchanger on the shell side (520°-245° F.) Under normal plant operation 375° F. crude preheat is obtained up to this point.

A 2-in. Fisher Wizard back pressure control is located on the effluent of the exchangers. Enough back pressure is held at this point to prevent vaporization within the exchangers and to maintain a back pressure on the horizontal settler of 125 to 140 lbs. Crude then passes to a flash tower where approximately 10% of the crude is flashed to the fractionators and the tower bottoms are charged to the furnace.

Emulsion Must Be Broken

In order to effect the greatest salt removal it is necessary that the salt be given every opportunity to contact water. Thus it was believed that water wash in addition to the original emulsification would be beneficial. However, any number of water washes is of no benefit if the film of the emulsifying agent is not broken, since this film encases dispersed droplets of brine. The smaller the droplets the "tighter" the emulsion and the more difficult it is to break. So far as possible, the emulsion must be made to fit the crude, conversely the demulsification process must fit the emulsion. If small droplets of water are to be coalesced it is necessary that the surface tension of their binding sheath be reduced to such point that the water droplets may break out by gravity.

Since surface tension is in direct relationship to viscosity it is obvious that to effect good salt removal the viscosity of the crude must be lowered to such a point that droplets of water are no longer restrained by their binders. In the case of water and crude, if the viscosity is reduced by temperature, a greater difference in specific gravity will exist between the oil and brine, thus allowing a quicker and better separation.

If droplets of water can be made to contact each other, thus forming larger droplets, gravitational separation is greatly accelerated. Turbulent flow is conducive for desired contact. Fur-

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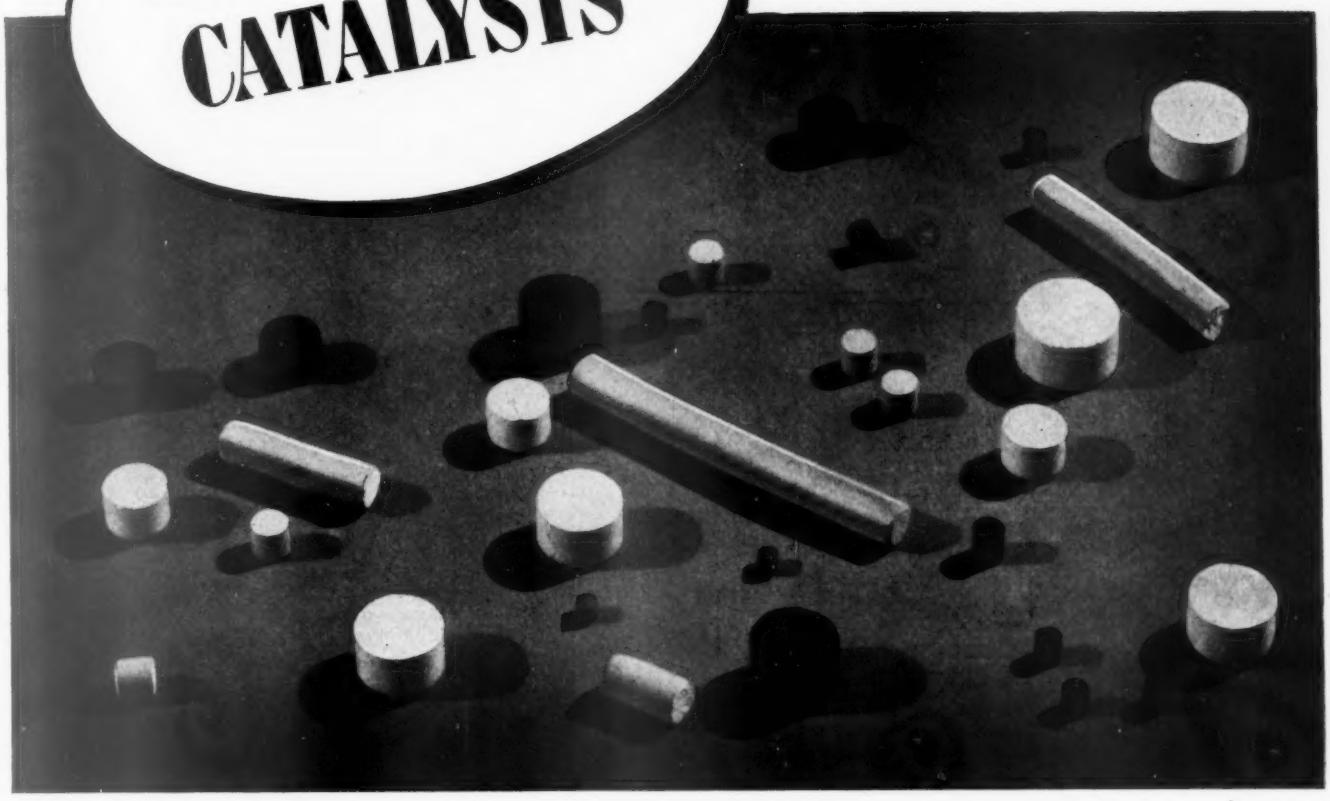

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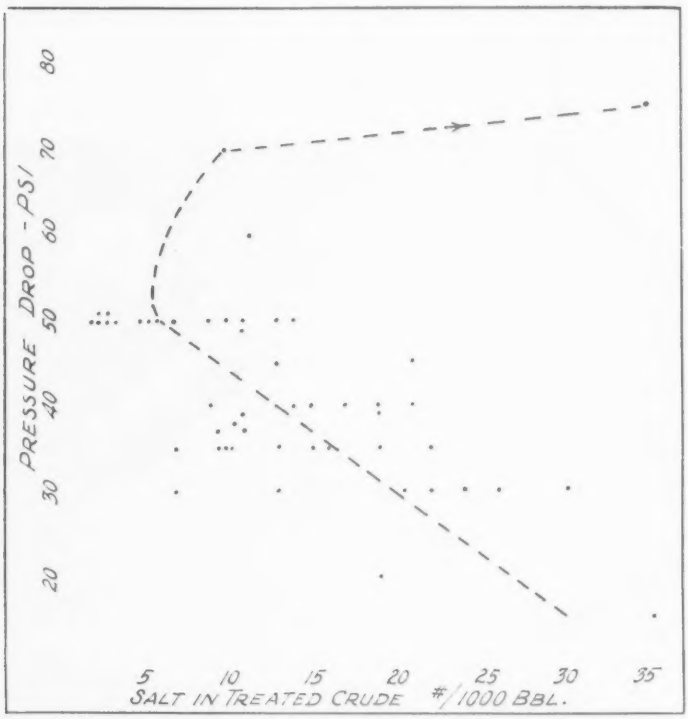

Fig. 2—Pressure drop vs. salt content of final treated crude

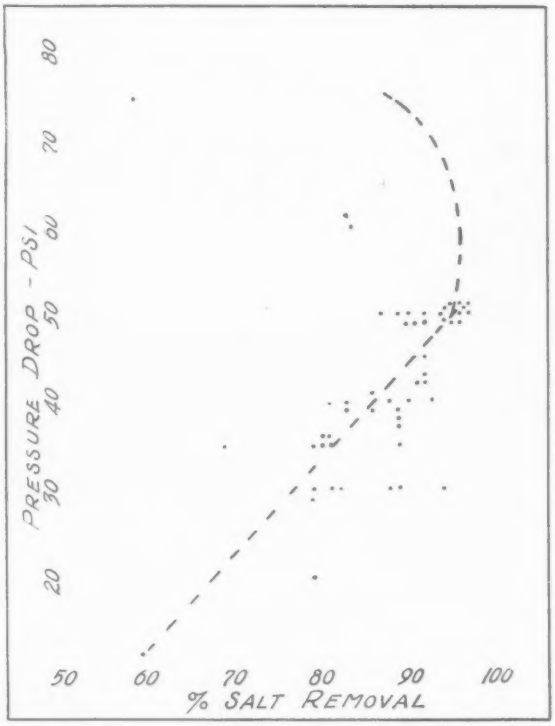

Fig. 3—Pressure drop vs. per cent salt removal

thermore, the presence of baffles, grit and chat make for more contact. Often, if emulsions are difficult to break, small quantities of demulsifying chemicals may be used.

Salt removal at the Ben Franklin refinery is subject to several variables, some of which are extremely important while others seem to be of little consequence. In every case however, it is deemed advisable that all variables be watched, recorded and correlated. It is important that the operators be educated to the variables and be kept abreast of all significant correlations.

Pressure Drop

Pressure drop is probably the most critical of all variables. A back pressure control valve on the discharge of the crude charge pump allows a constant pressure drop to be maintained. Previous to the installation of the control valve, a gate valve on the discharge of the crude pump was kept in a throttled position to maintain the necessary back pressure. Various pressure drops have been tried on our composite crude ranging from 0 to 100 lbs. With minimum pressure drop, salt removal is poor, ranging from 60 to 80% removal. Forty to 50 lbs. differential across the emulsifying valve seems to be ideal for our crude. Pressure drop in the region of 75 to 100 lbs. will often cause too tight an emulsion which, although often accompanied by excellent salt removal, is just as often subject to rather high water carryover (1% and greater).

Once the optimum pressure drop is found small variations do not seem critical, as can be readily evidenced by the fact that Ben Franklin uses a reciprocating charge pump rather than a centrifugal pump. Pressure drop vs. salt content of final crude, with other conditions unchanged, showed a very good correlation in the region of 0-60 lbs. pressure differential. Pressure drop vs. salt content of final crude (Fig. 2) and pressure drop vs. per cent salt removal (Fig. 3) with other conditions varying, were correlatable. Table 1 shows normal pressure measurements taken progressively through the salt removal equipment. The back pressure held on the system appears to be sufficiently high to prevent vaporization from occurring.

In order to get a feel of the pressures required, a small bomb was prepared and equipped with thermometer well and pressure gauge connection. The bomb was charged with a composite crude containing approximately 10% water in emulsion. The mixture was heated to 280° F. and pressures and temperatures were recorded as the sample cooled. At 270° F. the apparent vapor pressure of the sample was 50 lbs. (Fig. 5)

Temperature and Viscosity

Temperature, as previously discussed, must be high enough to reduce the surface tension of the oil to the point that water will break out. Assuming that surface tension is a direct function of viscosities, temperature viscosity curves of each of our crudes have been plotted and projected. (Fig. 4) It appears from this data that an S. U. viscosity of approximately 40 sec. or less on our crudes must be reached to obtain optimum salt removal.

Previous to a recent heat exchanger revamp, the temperature of the vertical settler was approximately 130° F. These conditions afforded salt removal only in the order of 50 to 80%, depending upon the type of crude charged and the amount of salt in the crude; i.e. with these conditions, the greater amount of salt in the crude charge, the better the per cent salt removal. Considerable amount of chemical was also used in an attempt to effect an emulsion break. The viscosity of our crude at 130° F. was 50 S. U. sec. and above.

Following the heat exchanger revamp, the temperature of the vertical settler varies between 190° F. and 220° F., depending upon the quantity and temperature of topped crude exchanging heat with the crude. At 220° F. and with an average crude charge, the S. U. viscosity is 34 secs. With the aforementioned pressure drop of 40 to 50 lbs, water flow of 5 to 15 Liquid Volume % of crude charge, and S. U. viscosity of 34

TABLE 1—Normal Pressure Measurements Taken Progressively Through the Salt Removal Equipment

	Press. Psig
Crude pump	210
Exchanger inlet	159
Baffle inlet	150
Baffle outlet	145
Vertical settler inlet	143
Horizontal settler outlet	140
Pressure outlet of Resid. to crude exchangers	133

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Fig. 3061

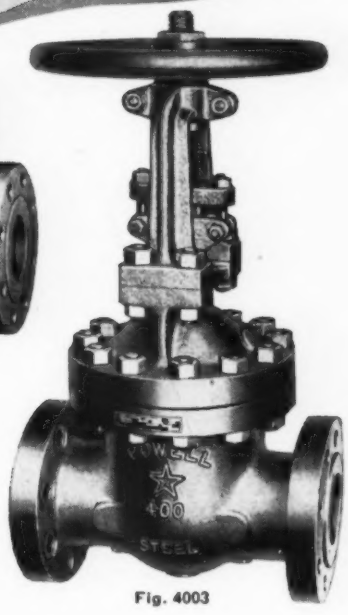

Fig. 4003

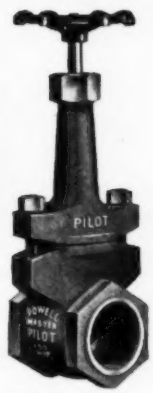

Fig. 1460

Fig. 1793

Fig. 241

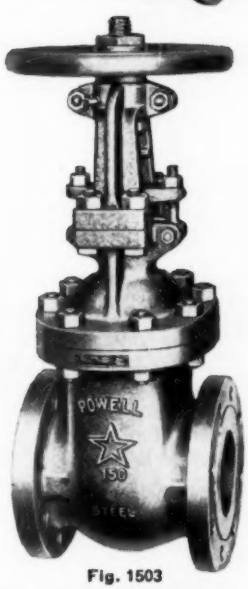

Fig. 1503

Fig. 4003—Class 400-pound Cast Steel Gate Valve. Has flanged ends, outside screw rising stem, bolted flanged yoke and taper wedge solid disc. Powell Cast Steel Valves are available in pressure classes from 150 to 2500 pounds, inclusive.

Fig. 3061—Class 300-pound Cast Steel Swing Check Valve with flanged ends and bolted cap.

Fig. 1460—Iron Body Bronze Mounted "Master Pilot" Gate Valve. Screwed ends, rising stem, bolted flanged bonnet and taper wedge solid disc. Also available in all iron.

Fig. 1503—Class 150-pound Cast Steel Gate Valve. Has flanged ends, outside screw rising stem, bolted flanged yoke and taper wedge solid disc.

Fig. 241—125-pound Iron Body Bronze Mounted Globe Valve. Has flanged ends, outside screw rising stem, bolted flanged yoke, and regrindable, renewable bronze seat and disc. Also available in All Iron.

Fig. 1793—125-pound Iron Body Bronze Mounted Gate Valve. Has flanged ends, outside screw rising stem, bolted flanged yoke, bronze seat rings and taper wedge solid disc. Also available in All Iron.

Catalogs on Request. Kindly specify whether you are interested in Bronze and Iron; Cast Steel; or Corrosion Resistant Valves.

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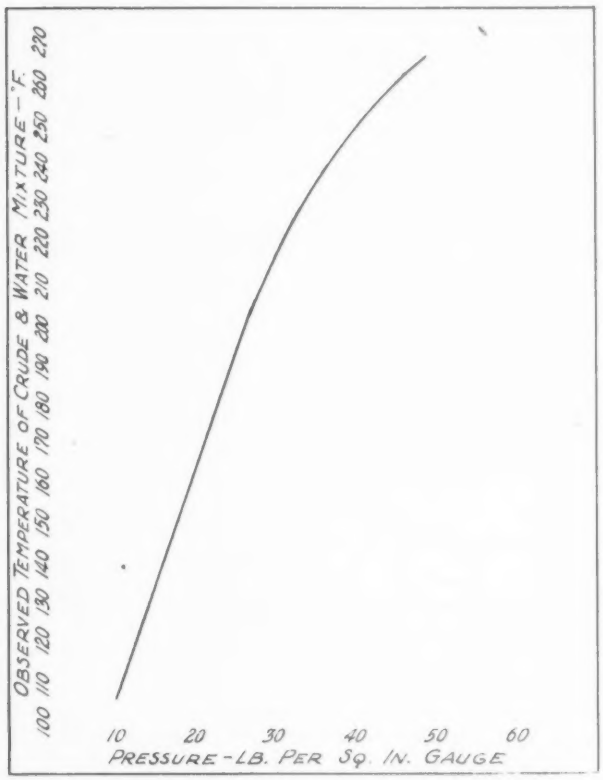

Fig. 4—Apparent vapor pressure of a composite crude sample plus 10% water

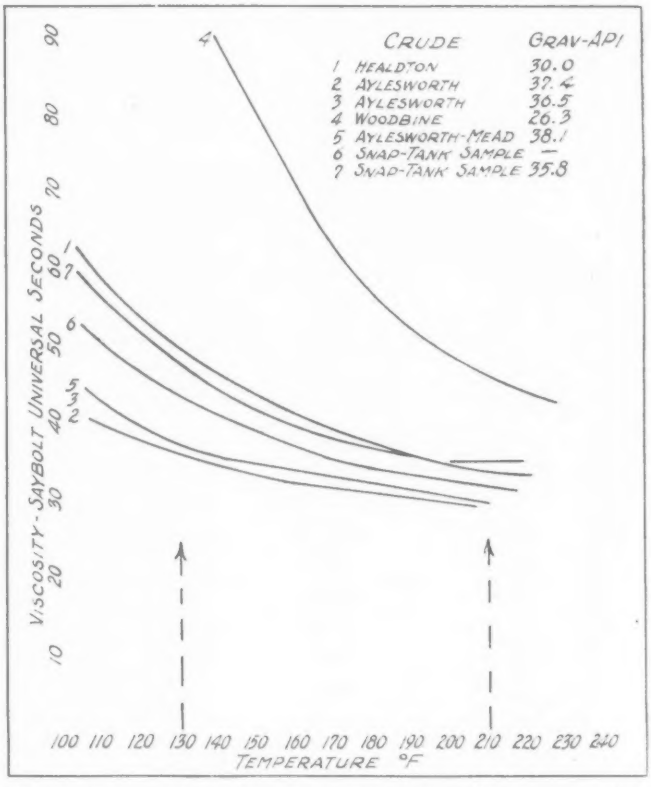
CRUDE GRAV-API
1 HEALDTON 30.0
2 AYLESWORTH 37.4
3 AYLESWORTH 36.5
4 WOODBINE 26.3
5 AYLESWORTH-MEAD 38.1
6 SNAP-TANK SAMPLE —
7 SNAP-TANK SAMPLE 35.8
VISCOSITY - SAYBOLT UNIVERSAL SECONDS
10 20 30 40 50 60 70 80 90
100 110 120 130 140 150 160 170 180 190 200 210 220 230 240
TEMPERATURE °F

Fig. 5—Temperature-viscosity curves of crudes processed in the Ben Franklin refinery

secs. 90-95% salt removal may be obtained day in and day out without any chemical addition.

The importance of maintaining low viscosity has been illustrated at the Ben Franklin refinery by operating at the above conditions and suddenly changing the charge stock to a 26.3 API gravity Woodbine crude, which with approximately the same temperature in the vertical settler increases the effective S. U. viscosity to 50 secs. The effect is as one would forecast, an increased water carry-over and reduced salt removal. If, however, demulsifying chemical is added during the charging of the heavy crude, substantially good salt removal is still obtained. For this reason the Ben Franklin refinery uses a small quantity of chemical as a safeguard against slugs of heavy crude or tank bottoms. It is planned to provide a system whereby segregated crude stocks cannot be charged directly to the stills, but must be blended with the composite crudes.

Temperatures required for the vertical settler should be in the range of 200° to 250° F. There seems to be no virtual gain in exceeding 250° F., since viscosity curves for Ben Franklin crude tend to flatten out in this range. At present vertical settler temperatures, no difficulty has been experienced with oil entrainment in the effluent brine. However, before the recent heat exchanger revamp, some oil entrainment in the brine was intermittently encountered.

TABLE 2—Analysis of H_2O from Hot Well

PH equals 8.0	Grains Per Gal.
Total hardness equals	5.0
Chlorides	4.2
P	.0
M	7.0
Suspended solids	0.4
Dissolved solids	14.1
Total solids	14.5

Water Addition and Brine Concentration

The quantity of water required for emulsifying the crude does not seem to be too critical. It appears that a minimum of 5% by volume fresh water injection should be used, but no maximum has been found other than limitations that might be found in added heat transfer duty due to the presence of additional water. As high as 15% fresh water charge has been used. However, it must be pointed out that in a water wash system such as the one outlined, a water level must be maintained. Since the salt concentration of the water level for a given water flow rate will vary with the salt concentration of the crude, it becomes important to check the water wash salt concentration and control the quantity of water charged accordingly.

It has been found at the Ben Franklin refinery that a concentration of 500 to 1000 lbs. NaCL per 1000 bbls. water is ideal, not particularly from a washing efficiency standpoint but as a safety factor, since a loss of temperature, exceedingly high pressure drop across the emulsification valve or some unforeseen factor, might cause a carry-over of a quantity of this concentrated salt water. However, if one disregards safety factors, it is known from our data that water salt concentrations on the order of 1500 to 2500 lbs./1000 bbls. water give a satisfactory water wash.

It is claimed by some refiners that a brine concentration of 2000 to 4000 lbs. salt per 1000 bbls. of water is optimum. To expect improved salt removal from the more concentrated brine is quite logical since a greater differential in specific gravities exists between the salt solution and the crude. It is also claimed that stronger brines contain higher concentrations of those demulsifiers which occur naturally in the crude. However, no reasonable correlation could be obtained at the refinery that would show the advantage of one brine concentration over another.

Obviously with refineries where water is expensive enough to become a definite factor, salt concentration should be regulated for minimum water consumption. The quality of the water used at the Ben Franklin plant might be questionable to some. The source of water is a hot well, which at times has a rather high dissolved and suspended solids concentration. (Table 2 and Table 3) Although the condition of the water might

TABLE 3—Analysis of Water from Vertical Settler

	Lbs./1000 Bbls. H_2O	Weight %
$CaCl_2$	192	19.5
$MgCl_2$	162	16.4
NaCl	634	64.1
	988	100.0
PH equals		7.9

7.6 grains/gallon suspended solids
590 grains/gallon dissolved solids

be suspected as slightly erosive or corrosive it has not shown any apparent ill effects. Should any corrosion be found in the vertical vessel at any time in the future, it is planned to install a ¾-in. ganister liner (luminite cement and ground brick ganister).

No trouble has been experienced with fouled heat exchangers as heat transfer coefficients have remained approximately the same throughout the run. Apparently all solids are discarded with the water drawn from the vertical settler. A definite advantage however, is assumed in the contact coalescing value of suspended solids when present in the emulsions.

Solids at Water Oil Interface

Accumulation of solids at water oil interface which might stabilize water oil emulsion has not been encountered. However, the try lines are so situated that periodic skimming of the interface would be possible if necessary.

Chemical Addition

Chemical used at the Ben Franklin refinery is Visco No. RM 64. As previously pointed out, it is doubtful if the chemical is needed 95% of the time, but it is good insurance against slugs of heavy crude or tank bottoms. The amount of chemical currently used is approximatelv 1 qt. per 500 bbls. of crude charge, which represents a cost of 1.0 mill per bbl. of crude.

Settling Time

It has often been asked among refiners and designers as to how much settling time is actually required for salt removal equipment. Some simple tests carried out on the Ben Franklin salt removal system may throw further light on the subject. Since a 20-ft. water level is maintained at the bottom try cock of the vertical vessel, samples of crude are available at each of the remaining two try cock levels, between the horizontal and the vertical settlers, and at the outlet of the horizontal settler. B. S. and W. is occasionally checked at each of these points to determine how quickly the emulsion break is taking place. Table 4 shows the "break" obtained during normal operation.

From the data in the table it appears that little settling time is required when a good break is experienced, but for cases of water carryover due to tight emulsion, the advantage of additional settling time seems doubtful. This fact was further substantiated during periods of high water carryover occurring previous to the heat exchanger revamp, as little emulsion break was encountered beyond the vertical settler. The final settler is insurance against faulty operation; i.e. high water levels, etc. Residence time and velocities throughout the salt settling equipment at 3000 b/d crude charge are shown in Table 5.

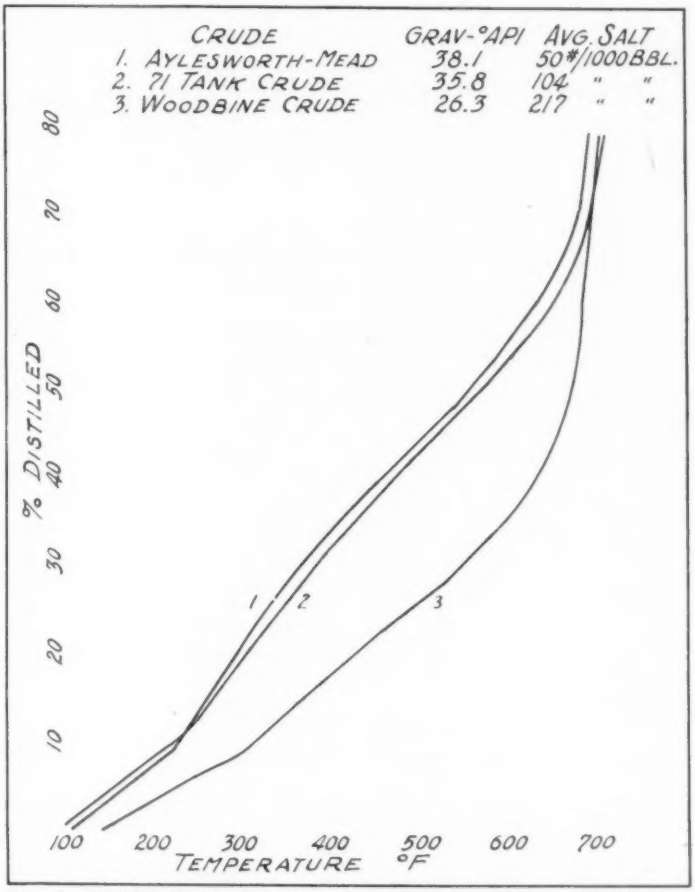

Fig. 6—ASTM distillation of various Ben Franklin crude charges

Contact Coalescing

The baffle section is intended to create a turbulent flow and a contact surface to coalesce so far as possible the droplets of water before they reach the vertical settler. Also, if any salt still remains coated with a paraffin sheath, the additional contact in this hot section tends to break down final resistance before entering the vertical settler. If the baffle had not been satisfactory, it was planned to use a grit or chat as a coalescing medium in the lower section of the vertical vessel. An ostensible need for the additional contact section was indi-

TABLE 4—Emulsion "Break" Obtained in Normal Operations
Basis 3000 b/d Crude Charge Rate

	No. 1 Valve	No. 2 Valve	No. 3 Valve	Between Settlers	Horizontal Settler Outlet
	100% water	26%	3%		.3%
	100% water	6.5%	4.8%	.2%	.2%
	100% water	100% water	8.0%	.3%	.2%
	100% water	8.0%	3.0%	.2%	.2%
Settling time above the water level at 3000 b/d Charge—Minutes	0	11	22	36	117

TABLE 5—Residence Time and Velocities Throughout Salt Settling Equipment
Basis 3000 b/d Crude Charge Rate

Equipment	Temp. °F.	Residence Time	Velocity Feet/Sec.
Pump to Tc Each	70		
Exchangers	70-210	3.17 Min	4.2
Baffles	210	1.08 Min	1.24
Vertical Settler	210	35.5 Min	.0074*
Horizontal Settler	208	81.0 Min	.0074

* Assumed 20ft. water level.

cated by a microscopic study of raw and washed crude made previous to the addition of the baffle section.

The raw crude showed three different types of crystals; one with definite angular plane surfaces, another in the form of small threads, and a third type which appeared as a black shapeless mass. Crystals with angular plane surfaces were of various sizes and represented approximately 75% of the total crystalized material. The thread type material constituted approximately 20% of the total and the remaining 5% were the black masses of shapeless substances.

Examination of crystals in the washed crude showed only the smallest of the angular plane crystals remaining plus all crystals of the other types. Crystals of the second and third class were not positively identified as salt crystals since they may have been a form of basic sediment, but it was reasonably concluded that the remaining minute angular crystals were salt. From these data it seemed that further contact of water with the crystals was necessary after the wax film had been broken with heat.

Obviously the baffle has been beneficial in this capacity since at on time previous to its installation could the salt content of the crude be consistently reduced to as low levels as is currently being accomplished. However, other factors were probably equally important. A representative month's crude run is shown in Table 7. A.S.T.M. distillations of various Ben Franklin crude charges are shown by Fig. 6. U.O.P. K (Characterization factor) estimated from gravity-viscosity correlations varies from 11.9 to 12.2 for various Ben Franklin crude charges. This indicates crudes which are predominantly paraffinic in nature. A composite crude evaluated by Bureau of Mines method also showed the crude to be paraffinic.

Typical data for the salt removal operation is shown by Table 6. From the data and observations made of refinery operations the following points should be emphasized.

1—Best emulsification is obtained with 40 to 50-lb. pressure drop across emulsifying valve.

2—Temperature within the vertical settler must be maintained for desired emulsion breaking viscosities (200-220° F.)

3—Pressure should be sufficient to prevent vaporization (130-150 psig).

4—Additional contact of water and crude should be induced after the crude viscosity has been reduced.

5—Water should be adequately metered to maintain a constant fresh water charge for a reasonable brine concentration within the vertical settler. (5-15 LV% of crude charge)

6—If chemical is used, adequate control and correlation should be utilized to minimize expenditure and obtain optimum results.

7—Operators must be made a part of this salt removal program by making all correlations available to them and emphasizing the monetary value of a salt free product.

TABLE 7—Representative Month's Crude Run at Ben Franklin Refinery

Gravity °API	Crude	Water LV%
30	Healdton }	28
32	Oscar }	
41	Joliff	7
36	Aylesworth	30
36	Mead	7
26	Woodbine	28
Average gravity of month's charge equals		32.0 API

TABLE 6—Typical Operating Data

(December-January Operation)

Temp. Vert. Settler °F.	Press. Drop	Water LV% of Crude	Water LV% Carryover	Brine Concen. Lbs. NaCl 1000 Bbls.	Crude Charge B/D	Salt in Lbs. NaCl 1000 Bbls.	Salt Out Lbs. NaCl 1000 Bbls.	% Removal	Chemical Used Quarts Day	Chemical Cost Bbl. Crude Cents Bbl.
210	40	5.0	0.4		2885	88	9	90	2	.037
200	35	7.0	0.2	570	2534	65	10	85	13	.275
200	35	8.5	0.2	1500	2550	125	13	89	6	.126
200	35	8.5	0.2		2548	121	7	95	12	.253
200	35	11.2	0.1		2526	120	7	94	12	.256
210	50	11.2	0.7	908	2441	124	6	95	10	.221
190	50	10.0	0.2		2445	109	13	88	9	.198
195	50	10.0	0.4	796	2754	121	9	93	6	.117
195	40	10.0	0.4		2721	124	14	89	9	.178
200	45	12.0	0.4	936	2730	180	13	93	11	.216
185	40	7.0	0.4	584	2177	101	13	87	8	.197
200	35	6.2	0.2		2500	77	10	87	8	.172
210	35	8.0	0.1		2821	105	10	90	8	.153
195	35	6.0	0.2		2232	120	9	93	0	0
210	35	6.0	0.2		3053	115	11	94	8	.140
200	40	6.0	0.2		3132	163	15	91	10	.171
200	45	6.0	0.2		3100	135	11	91	10	.176
220	50	9.0	0.2		3089	117	11	91	11	.190
200	80	9.0	0.3	1563	1983	85	10	88	3	.081
200	80•	7.0	0.8		3601	85	35•	59•	2	.036•
210	75	6.0	0.4	1560	2500	85	10	88	2	.043
210	10-15†	12.0	0.2	1572	2500	87	35†	60†	2	.043†
205	50	13.0	0.2		2226	80	6	93	8	.193
210	50	12.0	0.2	1160	2000	60	6	90	9	.255
215	20‡	10.0	0.1	2236	2000	88	18‡	80‡	8	.215‡
205	40	12.0	0.2	2092	3273	253	26	90	6	.098
200	40	12.0	0.2	724	3200	69	5	93	6	.101
205	45	12.0	0.2	700	2809	81	4	95	6	.114
210	45	13.0	0.2	700	2758	80	2	98	6	.117
200	50	12.0	0.2	400	3014	85	3	96	6	.107
205	50	13.0	0.1	420	3014	80	2	98	6	.107
200	50	13.0	0.2	444	2586	87	7	92	5	.104
210	50	13.0	0.1		2739	60	2	97	6	.118
205	50	13.0	0.1		2700	55	2	97	5	.100
200	50	13.0	0.1	564	2564	50	2	96	5	.105
205	50	12.0	0.2	450	2174	65	3	95	5	.124
200	50	12.0	0.1	500	1977	48	3	94	5	.136
205	50	11.0	0.2	460	1990	76	2	97	5	.136

• Pressure drop too high, poor emulsion break.
† Pressure drop too low, failure of back pressure valve.
‡ Pressure drop too low.

Properties of Surface Waters Affected by Refinery Wastes

Article 5 in a Series

By W. B. Hart

In charge of Waste Disposal
For Atlantic Refining Co.

Refinery wastes are usually disposed of by dumping them into a convenient lake or stream. To properly decide what treatment is necessary before they can be safely discharged into these waters, it is essential to know the normal properties of our lakes and streams and how they are affected by wastes.

This month Mr. Hart describes the main properties of our surface waters—physical, chemical and biological—and discusses the effects which changes in those properties may have on the natural plant and acquatic life.

IN ORDER to understand how refinery wastes will affect surface waters, it is necessary to know the general nature of these waters. Three phases of their nature must be considered—physical, chemical and biological.

Physical Characteristics

There are two major classes of surface waters, *flowing-waters* and *standing-waters*. The flowing-water series are designated the *lotic* environment, the standing-water series the *lentic* environment.

The outstanding feature of lotic environments is flow in one direction. In the regions of plains and prairies, and where streams are nearly at base level, flow is sluggish. Mountain streams usually are rapid. Only in large, wide rivers is wave action due to winds of any importance. If a transverse section of a stream were examined it would be found that the velocity varies in different parts. It diminishes as the sides and bottom are approached, and usually is maximum centrally as to the width of the stream, and within the first third of the depth[44, 45].

A second important (though indirect) feature is the erosion, transportation and sedimentation which always accompany stream currents. The character and rate of erosion depend largely upon the volume of water, the current velocity, and the character of the material composing the channel. The topography and geology of the drainage area of the stream influence the kind of sediment carried. Some materials are in suspension, and some are rolled along the bottom. The carrying power of water usually is said to vary as the sixth power of the velocity, so a small change in velocity will cause great change in the amount of material in suspension.

Suspended matter is highly important to refinery waste treatment and disposal for it affects both treatment methods and effluent turbidity. It may increase or decrease as the stream approaches its mouth, and usually is greatest in streams of the plains and low, flat country. Many of the country's largest refineries are located on such streams. Table 1 shows the general increase in turbidity (as an indication of the amount of suspended matter) from the source to the mouth of the Mississippi River. Table 2 shows the higher turbidity in streams of the low regions as compared to streams in mountainous or predominantly hard rock regions. The values in Tables 1 and 2 are from Clarke[46].

One important feature of turbidity in flowing-water lies in its interference with the penetration of light, which is essential to many biological activities in streams. In some parts of the Mississippi River the intensity of light falling upon the water surface is reduced by 90% at a depth of only 25 mm. Sudden variations in turbidity can have great effects upon the biological aspects of flowing waters, particularly when the turbidity normally is relatively low. Should a relatively high turbidity persist, it can change the character of a stream entirely.

Heretofore, the terms "suspended matter" and "turbidity," have been used without clear definition. A broad distinction can be made by classifying those particles which will settle in quiescent water after reasonable time as suspended matter, or settling suspended matter. Conversely, those particles which will not settle, either because of size, gravity, or some other reason, i.e., the nonsettling suspended matter, create the turbidity.

Another important characteristic of the flowing-water series is temperature. The more prominent features are:

1—There is pronounced tendency toward uniform temperature. This is true even in the deepest rivers, and often the difference between surface and bottom temperatures is negligible.

2—The temperature in flowing-water tends to follow atmospheric temperature. This is more pronounced in small streams than in large ones.

3—There usually is absence of thermal stratification. Such stratification may occur in deep streams to some extent, and has been reported, but it is of little or no importance.

The standing water series, i.e., the lentic environment, consists of lakes, ponds and swamps. Of these, lakes have been studied more thoroughly than any other form of inland water, but with the exception of the Great Lakes are of less importance to the disposal of refinery wastes than rivers. The discussions, therefore, will be confined to those matters pertinent to large bodies of water, such as Lake Michigan or Lake Ontario. The most important of the physical characteristics of lakes are those which have to do with temperature, currents and other water movements, and turbidity.

Much has been written into limnolog-

TABLE 1—Turbidity in the Mississippi River from Source toward Mouth.*

Sample Point	Turbidity P.P.M.
Minneapolis, Minn.	10
Moline, Ill.	117
Quincy, Ill.	173
Chester, Ill.	858†
Memphis, Tenn.	556‡
Baton Rouge, La.	1012§

*Turbidity values are means of 35 analyses from "The Composition of the River and Lake Waters of the United States." Frank Wigglesworth Clarke. Prof. Paper 135—United States Geological Survey (1924).

†Below confluence with the Missouri River.

‡Below confluence with the Ohio River.

§From records of an investigation.

TABLE 2—Turbidity of Various Important Rivers of the United States at Points Noted

River	Point of Observation	Turbidity P.P.M.
Androscoggin	Brunswick, Me.	9
Hudson	Hudson, N. Y.	13
Delaware	Lambertville, N. J.	16
Savannah	Augusta, Ga.	172
Alabama	Selma, Ala.	141
Illinois	Kampsville, Ill.	188
Tennessee	Gilbertsville, Ky.	153
Missouri	Kansas City, Mo.	1909
Arkansas	Little Rock, Ark.	755
Red	Shreveport, La.	790
Brazos	Waco, Texas	1462
Sacramento	Sacramento	66
Columbia	Cascade Rocks, Wash.	27
Spokane	Spokane, Wash.	5

ical* literature about the thermal stratification of lakes[47]. This is a seasonal temperature phenomenon. Chronologically there is first the "spring overturn" which is followed by the "summer stratification" of the lake. The upper stratum is known as the *epilimnion*, the middle is called the *thermocline*, and in this stratum there is a marked drop in temperature, and the bottom stratum is known as the *hypolimnion*. The circulation in the epilimnion and in the hypolimnion can be of importance to the proper disposal of waste waters.

The summer stratification is followed by the "fall overturn," and this by the "winter stagnation" period.

Although there is ample evidence that to some extent large bodies of water are subject to thermal stratification, masses of water such as the Great Lakes present conditions which do not exist in the moderate size, inland lakes where thermal stratification is pronounced. Wave action in the large lakes extends to greater depth, and vertical currents often are present. These conditions are pronounced in the Great Lakes, and although well defined thermoclines have been found[48], any consideration of stratification in the Great Lakes can be ignored.

Temperature investigations of the Great Lakes show that at or near the bottom the temperature in summer is very nearly 39° F. (4° C.), and surface temperatures are about 68° F. (20° C.).

As related to waste disposal, the most important features of lakes are current action, and wind and wave action. Generally there are three varieties of currents in lakes. They are *vertical*, *horizontal*, and *returning* or *undertow* currents. Vertical currents are usual only in large lakes, such as the Great Lakes. Horizontal currents are the common variety in all lakes, both large and small. Usually they are caused by winds, and their velocity has been established to bear a definite relationship to the wind velocity. Whipple[49] states that a wind velocity of 5 mi. per hr. produces a current velocity of 13 ft. per min., and a 30 mi. wind produces a current of 26 ft. per min. At a depth of 10 ft. the current velocity is approximately 60% of that at the surface, and at 20 ft. it is only 25%.

Wave action causes practically no effect of translation of water, but does cause a mixing action, particularly near the shore where "bottom drag" causes the crests of even relatively small waves to fall forward instead of returning to their original position as in true waves of oscillation. This degree of translation also has an influence on returning currents.

Turbidity and suspended matter are of particular importance in lakes, principally because in lakes there is not the same current action which in flowing waters, through erosion and the like, contributes to the materials in suspension. Also because of this lesser current effect, sedimentation action is more pronounced and the water clears up relatively quickly after having been turbid.

Although all kinds of materials contribute to that turbidity and suspended matter which does occur in lakes, contrary to the condition in streams much of it is made up of living organisms, the plankton. Plankton is a term used to designate the heterogeneous groups of minute animals and plants which inhabit all waters. They usually are without control of their own movements and are subject to the action of the waters, although there are definite exceptions. Plankton are discussed and classified by Welch[47].

Light penetration is of great importance to plankton, which in turn is important to lake cleanliness. Consequently, considerable importance should be accorded any disposal of refinery wastes which affects the turbidity or suspended matter in any lentic environment.

Chemical Characteristics

For the discussion of chemical characteristics of water no distinction need be made between the lotic and lentic series.

The chemical complexity of surface waters will be understood more readily if there is realization that lakes and streams are catchments for innumerable substances which come to them from the atmosphere and from their entire drainage basins. Also, water is the most general solvent known, and in various ways is active chemically. When this chemical activity, and that of substances in solution and of live forms living in the water, are considered as parts of an over-all concept, the complexity of any water environment will be apparent.

Differences between waters are due to the dissolved substances for which the water serves only as a vehicle. Therefore, it is the effects of refinery wastes upon the dissolved substances which are important here.

There are three important groups of substances to be considered. The first group is the dissolved gases; of these oxygen and carbon dioxide are the outstanding.

It well could be said that oxygen is the deciding factor in the nature of any body of surface water. The vast majority of aquatic life forms require dissolved oxygen to live. Many of these forms, both small and large, are essential to the process known as stream self-purification, which will be described later in this article.

In the absence of dissolved oxygen surface waters cannot repurify themselves. They become foul and septic, and are devoid of all but a few life forms, either plant or animal. They build up dissolved gases entirely different from those in clean waters, hydrogen sulfide being prominent among them. Surface waters so affected require long periods of time, or miles of flow, to recover their cleanliness if it ever is recovered without admixture with other waters which are clean and pure.

There are two principal sources of dissolved oxygen in surface waters. One is from direct absorption from the atmosphere at the water surface, and the other from the photosynthetic action of green (chlorophyll-bearing) aquatic plants. Diffusion of oxygen through the water surface, and throughout the whole body of water, is an extremely slow process in quiescent, or nearly quiescent water.

But in nature this situation is taken care of by various forms of agitation by which the oxygen is distributed through convection. Currents and wind and wave action are the major factors which effectively disperse the oxygen. These, however, are largely surface actions, and not infrequently the greater depths, even in rivers where mixing action is most pronounced, are almost devoid of oxygen. The solubility of atmospheric oxygen is shown in Table 3.

There are several sources of the carbon dioxide in surface waters. It is absorbed to some extent from the atmosphere, which normally contains about 0.035% by volume. It also is carried into the surface waters by ground water, and is evolved in the decomposition of organic matter, the respiration of animals and plants, and in chemical reaction with mineral substances in the water.

When carbon dioxide dissolves in water some combines with the water to form the weak carbonic acid. Thus, both free carbon dioxide (CO_2) and carbonic acid

TABLE 3—Solubility of Oxygen in Water in Relation to Temperature

When water is exposed to an atmosphere containing 20.9 per cent oxygen under 760 mm. pressure including the vapor pressure of water.

Temp.		Solubility	
°C.	°F.	ppm.	cc.*
0	32.0	14.62	10.23
1	33.8	14.23	9.96
2	35.6	13.84	9.68
3	37.4	13.48	9.43
4	39.2	13.13	9.19
5	41.0	12.80	8.96
6	42.8	12.48	8.73
7	44.6	12.17	8.52
8	46.4	11.87	8.31
9	48.2	11.59	8.11
10	50.0	11.33	7.93
11	51.8	11.08	7.75
12	53.6	10.83	7.58
13	55.4	10.60	7.42
14	57.2	10.37	7.26
15	59.0	10.15	7.10
16	60.8	9.95	6.96
17	62.6	9.74	6.82
18	64.4	9.54	6.68
19	66.2	9.35	6.54
20	68.0	9.17	6.42
21	69.8	8.99	6.29
22	71.6	8.83	6.18
23	73.4	8.68	6.07
24	75.2	8.53	5.97
25	77.0	8.38	5.86
26	78.8	8.22	5.75
27	80.6	8.07	5.65
28	82.4	7.92	5.54
29	84.2	7.77	5.44
30	86.0	7.63	5.34

* cc. per liter at 0° C. and 760 mm.

* Limnology—the scientific study of fresh waters, especially of ponds and lakes.

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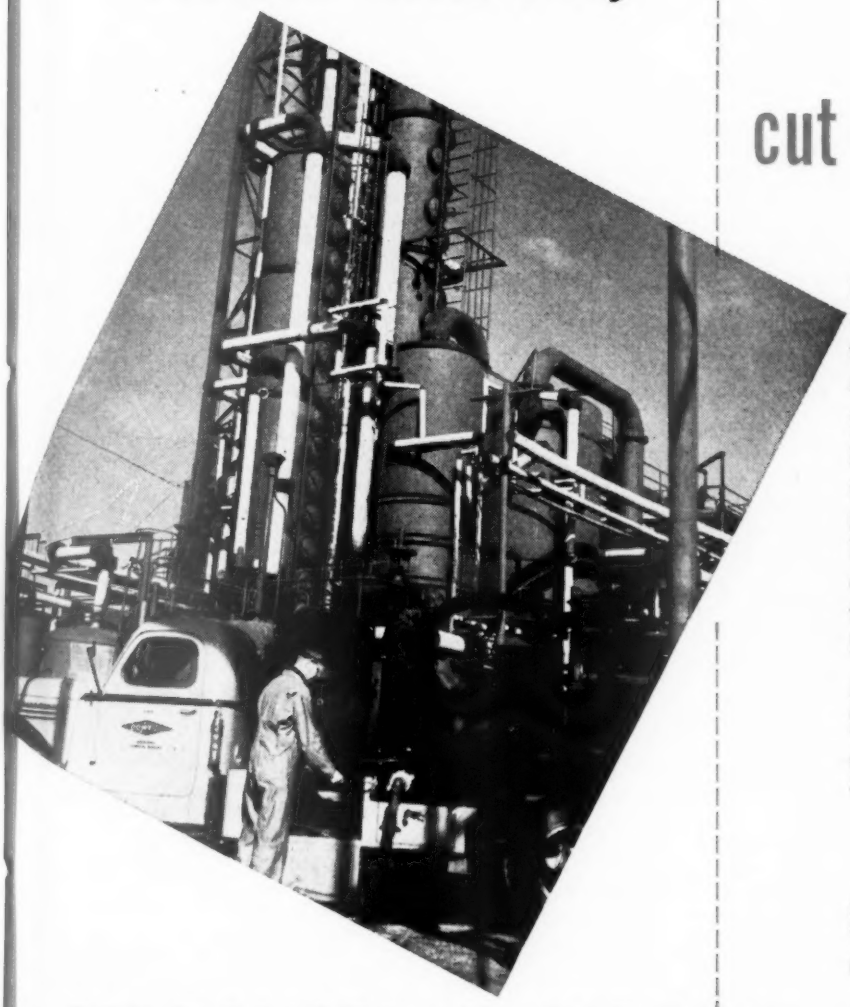

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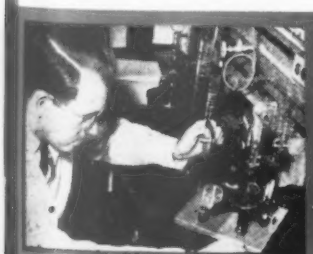

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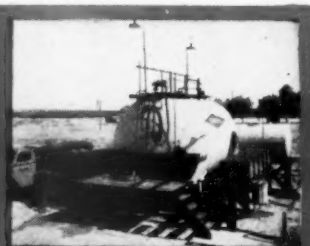

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TABLE 4—Solubility of Carbon Dioxide in Water
(From Volumetric Analysis by Sutton)

Temp. ° C.	Temp. ° F.	cc. per liter	Parts per million for stated partial pressure of carbon dioxide in the atmosphere			
		0.01%	0.01%	0.04%	0.06%	0.08%
0	32.0	0.1713	0.34	1.4	2.0	2.8
4	39.2	0.1473	0.29	1.2	1.7	2.4
8	46.4	0.1283	0.26	1.0	1.5	2.1
12	53.6	0.1117	0.22	0.9	1.3	1.8
16	60.8	0.0987	0.19	0.8	1.2	1.6
20	68.0	0.0877	0.17	0.7	1.0	1.4
24	75.2	0.0780	0.15	0.6	0.9	1.2
28	82.4	0.0780	0.15	0.6	0.9	1.2

(H_2CO_3) are present at the same time. The relationship is said to be represented as follows:

$$CO_2(gas) \rightleftharpoons (1-n)\ CO_2(dissolved) + n\ (H_2CO_3)$$

in which n is said to be greater than 0.5. In other words, more than half the carbon dioxide in solution is in the form of carbonic acid, and the remainder as free carbon dioxide. The importance of this will appear later. The solubility of carbon dioxide is shown in Table 4.

Both dissolved oxygen and carbon dioxide are consumed or dissipated in various ways. Oxygen is consumed in the respiration of animals and plants, and in the oxidation of organic material. Increase in temperature lowers the solubility of oxygen and causes its release to the air. Underground waters usually are low in dissolved oxygen and exact some from surface waters into which they flow. To some extent displacement by other gases causes loss.

Dissolved oxygen, therefore, can be looked upon as a checking account in a bank. There are deposits from the various sources, and withdrawals as just described.

Carbon dioxide, also an essential component in surface waters, is consumed in several ways. Photosynthesis by aquatic plants consumes large quantities. Aquatic organisms consume considerable amounts in the formation of marl. Agitation, evaporation, and gaseous displacement cause minor losses. Thus, carbon dioxide also can be looked upon as a balance.

Other gases which occur in surface waters are nitrogen, ammonia, hydrogen sulfide, sulfur dioxide, hydrogen, and carbon monoxide. Of these only nitrogen and ammonia are of importance, and only nitrogen is present in other than very low concentration.

Dissolved Mineral Matter

Carbon dioxide plays an important role in connection with the mineral matter dissolved in surface waters. Of all the mineral substances in solution, the bicarbonates and carbonates, together with the free carbon dioxide and the carbonic acid, are the most important.

Calcium carbonate and magnesium carbonate are practically insoluble, but are acted on by carbonic acid to form bicarbonates, which are soluble. Should the bicarbonate be broken down, and part of the CO_2 be released (that part sometimes known as the "half bound"), the normal carbonate again results and settles out. Sometimes this normal carbonate settles to the bottom and becomes marl, is covered over, and never returns to the soluble bicarbonate form. But some carbonates also remain in the reaction zone and may be converted later to bicarbonates. Thus, there is a continual interchange between the carbonates, bicarbonates, carbon dioxide and carbonic acid. This interchange is intimately associated with the reaction of surface waters (i.e., the acidity, alkalinity or neutrality), and with the hydrogen ion concentration, i.e., the pH.

For biological work the acceptance of pH 7.0 as actual neutrality is not always satisfactory since it does not bear direct relationship to the pH at which the acidity is just neutralized by a base. This point is affected by both temperature and the concentration of salts in solution. Space cannot be taken to examine this condition here. Suffice it to say that true neutrality may differ to some extent from pH 7.0.

Hydrogen ion concentration in natural surface waters ranges from about pH 3.0 to pH 10.5. The majority of the surface waters, however, fall within the range pH 6.0 to pH 8.5.

Many other mineral substances are dissolved in surface waters. Calcium and magnesium have been mentioned. They are the principal causes of hardness in water. Sulfates and chlorides usually are present, also sodium, potassium and small quantities of other metals and other salts such as the phosphates and nitrates. The concentrations of the important mineral substances in solution in the surface waters of the country are shown in Table 5.

Certain organic substances are dissolved in surface waters. Among these are a variety of nitrogen compounds which have not been differentiated, various carbon compounds, and a small concentration of fats. The presence of proteins and various aminoacids such as tryptophane, tyrosine, histidine, and arginine has been demonstrated. The concentration of organic substances, however, is relatively small, but is of great importance.

Biological Characteristics

Volumes have been written on hydrobiology, which really is the matter under consideration when biological characteristics of surface waters are discussed. But for the purposes of this article there need be only brief mention of important features.

First consideration should be given the various forms of aquatic life. There are three general levels of life, (1) the bacteria and similar organisms; (2) the plankton, small invertebrates, bottom forms such as nymths, and the very small plants; and finally (3) the larger plants, fishes, amphibians and reptiles. There is no definite line of demarcation between these three groups insofar as size is concerned, for the young of some of the large forms are no larger than some of the middle group. And some of the plankton are microscopic, and hardly larger than some of the larger bacteria.

Of all the aquatic life forms, usually the fishes are regarded as the most important. They are the largest and most spectacular, and make possible the extensive inland fisheries and the recreational fishing which is the basis for a vast industry. Actually, however, the two smaller groups are the more important in many ways. In the first place, the smaller forms are the food of the larger ones, and unless a food supply is present the larger ones will leave. And the smaller forms, largely the bacteria, are what might be termed the "clean-up group" of the surface waters. They are the first to come into action in the process of stream self-purification.

Stream self-purification can be considered only briefly, but is too important to waste treatment and disposal to be ignored. It is the process by which any body of surface water digests the natural or unnatural organic water which may be flushed, washed or discharged in-

TABLE 5—Approximate Means of the More Important Components of the Mineral Matter in Surface Waters

Component	Concentration in parts per million— In 5% of the waters is less than:	In 50% of the waters is less than:	In 95% of the waters is less than:
Total dissolved solids	72	169	400
Bicarbonate (HCO_3)	40	90	180
Sulfate (SO_4)	11	32	90
Chloride (Cl)	3	9	170
Nitrate (NO_3)	0.2	0.9	4.2
Calcium (Ca)	15	28	52
Magnesium (Mg)	3.5	7	14
Sodium and Potassium (Na + K)	6	10	85
Iron (Fe)	0.0	0.3	0.7

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to it. The essential condition in the water is the presence of an ample supply of dissolved oxygen.

When organic matter is discharged into surface waters the first effect usually is the creation of turbidity, although some wastes containing high concentrations of organic matter are perfectly clear. Almost immediately after entering the water any suspended matter starts to settle to the bottom and forms a sludge, or ooze. Fine particles and even colloidal matter are carried down in aggregates with the larger particles.

Sometimes the organic matter attracts various aquatic forms. Fish may accumulate at the discharge to feed, and may live or die depending upon the toxicity of the waste. Bacterial action of decomposition starts almost immediately. Dissolved oxygen is used and the concentration decreases.

As soon as decomposition is well established the various forms of water fungi develop on the rocks, piles, or other structures in the water. These plants grow in creamy to yellowish-brown masses, sometimes throwing out streamers. They feed on the waste, disintegrate it, and further reduce the oxygen and increase the carbon dioxide. But when the level of dissolved oxygen falls to around 3 or 4 ppm. the fungi die and become additional food for the bacteria.

Such is the zone of degradation which is found at the discharge wherever organic matter in solution or suspension is introduced into surface waters. This zone may extend for a considerable distance from the point of introduction or may be localized.

But usually the waters are subjected to the action and conditions of a second zone commonly known as the zone of active decomposition.

The zone of active decomposition always occurs when the pollution is heavy. It has its inception, according to Suter[50], when the dissolved oxygen concentration falls below about 4 ppm. The dissolved oxygen may disappear entirely as the waste passes through this zone, so that in the middle region none is present. Then, as decomposition progresses the oxygen demand gradually decreases and dissolved oxygen again appears. The complete disappearance of dissolved oxygen may not occur when the pollution is relatively light, but when the organic waste load is heavy the zone of active decomposition may extend for several miles. Since this zone usually is large in area, as compared to the zone of degradation, some authorities such as Kolkwitz[51] and Marsson[52] do not recognize the zone of degradation but include it in the zone of active decomposition.

As long as dissolved oxygen is present in the water the decomposition proceeds under conditions known as *aerobic*, i.e., in the presence of oxygen. The bacteria responsible for the decomposition are known as *aerobes*. In general, they cannot live unless oxygen is present. The principal end products of their activity are water and carbon dioxide as a result of the oxidation of the hydrogen and carbon in the organic matter.

When the dissolved oxygen disappears, as in the center of the zone of active decomposition, a different set of conditions results. Anaerobic decomposition sets in, resulting from the activity of anaerobic bacteria. These forms, in general, cannot live in the presence of oxygen. They are predominantly reducing in their action, and although there usually is an increase in the formation of carbon dioxide, other compounds such as hydrogen sulfide, ammonia, nitrites, and various other obnoxious compounds are formed.

Toward the lower end of the zone of active decomposition the first evidence of a return to normal stream cleanliness appears. The greater part of the demand for dissolved oxygen has been satisfied, and some oxygen is present in solution. The concentration of oxygen will increase and gradually approaches saturation. Anaerobic bacteria are replaced by aerobic forms in vast numbers. Anaerobic forms of protozoa and similar animals disappear and aerobic forms take their place. Small green plants appear. The conditions mark the beginning of the zone of recovery.

In the zone of recovery the water clears, and the bottom also becomes clean and comparatively free of any septic sludge formation. Bacteria decrease markedly in number, and because they do, since they are the food of the protozoa and similar animals, these latter forms also begin to disappear rapidly. Large green plants appear farther along, and as this final zone gradually merges into the zone of clean water beyond, all the conditions and life forms common to clean waters of the region, both animal and plant, return to establish a normal population. Thus, the stream has purified itself.

It should be understood that the above process follows only when the impurities which have caused the degradation are organic, and when the septic conditions characteristic of the zone of active decomposition are not so widespread that the entire surface water is involved as a result of overwhelming and continuous waste load. The mechanics of the process of stream self-purification serve to emphasize the importance of the microscopic and macroscopic life forms in the waters.

The chemical reactions and contents of clean surface waters have been discussed, and these chemical contents, together with small concentrations of organic matter, are the basis of tastes and odors. The tastes and odors of various waters sometimes are characteristic to certain lakes and streams.

With the exception of the effects of pathogenic bacteria, usually there is no toxicity to be considered in connection with clean surface waters. But the absence of toxicity in itself is a characteristic which is directly related to the possibility of introducing toxic substances in untreated refinery wastes.

Turbidity, suspended matter and color all are measurable characteristics of clean surface waters subject to increase or other effects of untreated refinery wastes. Thus, all these various characteristics of clean surface waters can be correlated with characteristics of untreated refinery wastes, and the effects of the wastes are the connecting link in the correlation.

The discussions of surface water conditions which have been presented are the briefest which will permit inclusion of the various features important to the disposal of wastes, and to the effects these wastes produce. Much has been written about surface waters of all kinds. For more detailed study there should be reference to Welch[47], Whipple[49], Needham and Lloyd[53], Ward and Whipple[54], and Clarke [46].

It is the effects which wastes have upon the normal natural conditions of surface waters. the aquatic life they support, and the uses to which they may be applied, that are the major guides in designing for waste treatment and disposal. The natural conditions of surface waters have been discussed here. The effects of the various types of wastes will be taken up in the next article.

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Patent Trends in Petroleum Refining

By Peter J. Gaylor

Patent Attorney and Editor "The Technical Survey"

Chemicals and resins involving petroleum hydrocarbons are the main topics of discussion in this month's review of recent patents issued to oil companies. Patents are described by which olefins are used to obtain esters of salicylic acid (Sinclair), petroleum acids recovered from asphaltic still bottoms yield halogenated amides (Sun), and branched chain hydrocarbons can be oxidized to peroxides (Shell). In the resin field, Socony-Vacuum has produced hard resins from chlorinated wax and aromatics, and Shell has used allyl type compounds to condense castor oil and yield drying oils.

Chemicals

As our oil resources become reduced, a trend will be observed toward specialization by the oil companies. Already the Pennsylvania grade crude people are beginning to advertise resins and specialty products, and if the price of crude begins to increase gradually, outlets to higher priced products will be sought. Hence, it can be expected that many of our petroleum concerns will eventually end up as chemical producers.

One firm which has been concentrating on chemicals in recent years is Sinclair Refining Co. One of its new patents (U. S. 2,397,498) involves the **esterification of salicylic acid with olefins**, such as octene-1 or mixtures of refinery olefins boiling in the range 212-257° F. Boron fluoride is employed as the catalyst. Alkylation of the acid is minimized by using a temperature of above 100° F., and boron fluoride in the proportion of 0.05-0.5 mole per mole of acid.

Standard Oil of Indiana obtained a patent (U. S. 2,397,508) on producing **naphthenhydroxamic acids** by adding hydroxylamine or its salts to a mixture of an ester of a naphthenic acid and an alcohol, the weight ratio of alcohol to ester being about 0.3 to 1, and then adding at least a neutralizing quantity of a base to the mixture.

One patent issued to Sun Oil Co. (U. S. 2,394,871) discloses the preparation of **halogenated amides** from petroleum acids. The latter are preferably those recovered by neutralizing asphaltic still bottoms with alkali, and consist of saturated acids containing cycloaliphatic rings, and have the general formula $C_nH_{2n}{-}_xO_2$, in which n is 13-30 and x is 4-10. Suitable acids are also obtainable by oxidation of naphthenic oils. They may be separated into more or less "pure" individual acids by fractional distillation in vacuo.

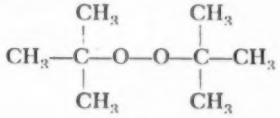
These acids are first reacted with urea at 150°-200° C. at atmosperic pressure or higher, for 10-20 hrs. Optimum proportions are two moles of acid per mole of urea. After cooling, the crude product is washed with sodium carbonate. These amides are viscous liquids, the properties of which have not yet been fully investigated. They have the group formula $C_{n-1}H_{2n-x-1}CONH_2$.

Halogenated products may be obtained by dissolving the amides in carbon tetrachloride and passing through dry chlorine at 20-30° C. until 1-3 atoms per molecule are absorbed. The halogenated compounds are solids or liquids, stable at high temperatures, and have boiling ranges of 175°-380° C./2 mm. They are expected to find uses as additives in lubricants and as intermediates in organic syntheses.

By the controlled **oxidation of branched chain hydrocarbons**, Shell Development Co. has succeeded in producing a number of interesting **peroxide** products (U. S. 2,395,523).

For example, isobutane reacted with oxygen, in presence of HBr, in the ratios of 2:2:1, respectively, at 150° C. and with 3 minute contact time, gave an 87% conversion of the oxygen into oxygenated products, 42% appearing as di(tert. butyl) peroxide, 39% as tert. butyl alcohol, 7% as isobutyric aldehyde, and 5% as other oxygenated products.

The peroxide has the structure:



It is a water-white, water-immiscible liquid having a pleasant odor, and boiling at 108-110° C. Its specific gravity is 0.796 at 20° C. The compound is un-O_7, in which n is 13-30 and x is 4-10 It does not explode when ignited, but burns with a sooty flame. When compared with other peroxides, it is surprisingly stable and will not explode when dropped onto a hot plate maintained at 250° C. It is proposed as a polymerization catalyst and as a diesel dope.

In its U. S. 2,390,576, duPont discloses an interesting method for producing **carboxylic acids.** It has been found that in presence of certain chromites, carbonyl compounds containing an active hydrogen atom on the carbon adjacent the carbonyl carbon, can add on carbon dioxide and water to produce acids.

In one example, using a silver-lined pressure reactor, 24.5 pts. cyclohexanone, 25 pts. water, 52.5 pts. sodium bicarbonate, 22.5 pts. glacial acetic acid (sealed in an ampoule), and 2 pts. manganese chromite, previously treated with hydrogen for 4 hrs. at 400° C., were allowed to react for 20 hrs. at 300° C. A quantitative yield of **pimelic acid**, was obtained, allowing for recovered cyclohexanone, together with a small amount of adipic acid.

Phillips Petroleum has found that **liquid cyclohexene forms solid addition compounds with copper halides.** Yields of 99+ of $C_5H_8 \cdot Cu_2Cl_2$ have been obtained. The latter consists of minute cream-colored crystals which decompose at 200° F. The reaction appears to be characteristic of monocyclic monoolefins and their alkyl substitution products. The invention is applicable to separating such olefins from complex mixtures (U. S. 2,386,256).

One Phillips patent (U. S. 2,386,372) shows the production of **cyclic ketones by vapor phase oxidation of cycloparaffins.** When methylcyclohexane, for example, is preheated to 300° C. with air (1:5 by vol.) and passed over a silver oxide on asbestos catalyst at 400-450° C. (in a copper tube), the product yields a fraction boiling between 160-170° C., consisting mainly of the three methylcyclohexanone isomers.

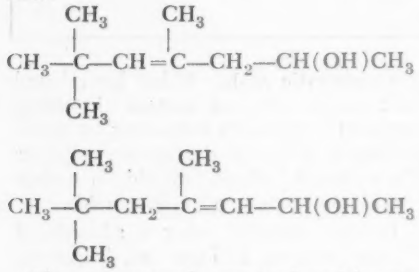
The production of **succinic and maleic acids from butyrolactone** has been demonstrated by Danciger Oil & Refineries, Inc. in its U. S. 2,385,518. Butyrolactone is claimed to be available in substantial amounts from cheap source materials such as pyroligneous acid residues. Vapor phase oxidation at 220-250° C. in presence of vanadium pentoxide and copper oxide is employed.

A **gold halide catalyst** is employed by duPont in producing **vinyl halide** by reacting an acetylenic compound in vapor phase with a hydrogen halide (U. S. 2,389,626).

One of Shell's patents on the production of **triallyl phosphate** issued as U. S. 2,394,829. It will be recalled that these esters are useful in the production of polymers, plasticizers, etc. The method employed involves reacting phosphorus oxychloride with an excess of allyl alcohol in toluene solution at −30° to −40° C. in presence of pyridine. The ester is ob-

tained in good yields and has a boiling point of 80° C. at 0.5 mm.

Union Oil Co. of California has produced some unusual **unsaturated branched chain aliphatic alcohols** having the structures:



These compounds are produced by reducing unsaturated aliphatic methyl ketones by adding an aluminum alkoxide dissolved in alcohol to unsaturated ketones in absence of hydrogen at such a rate that the alkoxide concentration does not exceed 0.1 molar and at below 100° C, followed by hydrolysis (U. S. 2,394,-848).

These alcohols are obtained as colorless crystals of melting point 146-7° C. The saturated alcohol has a boiling point of 91-94° C. at 25 mm., specific gravity of 0.8265.

One interesting patent issued to Research Corporation (U. S. 2,395,638) covers the **hydroxylation of cyclic hydrocarbons** by treating them with hydrogen peroxide in an initially anhydrous environment, in presence of an oxide of a metal (Os or Cr), which forms unstable peracids. In this manner it has been possible to produce 58% cyclohexane diol-1,2 and 35% adipic acid from cyclohexene, 22-30% phenol from benzene, and 30% cresols from toluene. An almost quantitative yield of anthraquinone is obtained from anthracene.

Resins

Pittsburgh Plate Glass Co. has been able to **copolymerize linseed oil with dicyclopentadiene**, thereby producing a solid resin useful as a "gum" in paints and varnishes. These gums are inexpensive to produce and are readily compatible with drying oils. They also have the further advantage of speeding up drying of the paint or varnish film to a hard, tack-free state.

A copolymer is prepared by autoclaving 14 pts. dicyclopentadiene with 7 pts. bodied linseed oil at 180-260° C. for 2-4 hrs. The product is poured into trays to harden. It is a somewhat brittle mass, which when heated in the ratio of 224 pts. copolymer and 128 pts. oil, shows a body of P(Gardner-Holdt) after 100 minutes at 530-560° F., in 50% concentration in naphtha (U. S. 2,390,530).

Some interesting **castor oil products** have been produced by Shell Development Co. and described in its U. S. 2,-394,742. Although castor oil is classed as a non-drying oil, it can be condensed with suitable materials, particularly allyl type compounds, to give excellent varnish oils. The treatment is preferably carried out at castor oil dehydrating conditions, usually in presence of a dehydrating catalyst such as $NaHSO_4 \cdot H_2O$.

In one example, a mixture containing 250 gms. diallyl phthalate and 250 gms. raw castor oil, to which was added 3 gms. of $NaHSO_4 \cdot H_2O$, was heated to 250-260° C. in a closed vessel fitted with means for collecting water distillate. About 13.5 cc. of water were collected (theoretical: 14 cc.), the heating being continued until a viscosity of Body Y (Gardner-Holdt) was obtained. The product was decanted from the dehydration catalyst, diluted with a hydrocarbon thinner, and applied to a tinned panel which was dried at 250° F. for 1 hr. A loss of weight amounting to 12.5% of the product occurred, showing that the material possessed drying oil characteristics.

Excellent varnishes are claimed to be obtained, particularly with alkyd resins.

Socony-Vacuum has been able to produce **hard resins**, soluble in varnish resin solvents, by reacting highly chlorinated wax (containing 40-60% Cl) with aromatic compounds, in proportions to theoretically result in monoalkylation of the aromatic. The aromatic may be benzene, phenol, diphenyl, diphenyl oxide and naphthalene, the molecular weights of the resins usually ranging somewhat above 1000.

In one example, 600 gms. of chlorinated wax (45% Cl), 1430 gms. phenol (100% excess), 180 gms. $AlCl_3$ (30% by wt. on chlorwax) and 300 gms. of zinc dust gave a condensation product of about 40% phenol content which consisted of a light brown, hard resin. The color can be reduced to pale yellow by hydrogenation with Raney nickel, using dioxane as a solvent (U. S. 2,394,560).

Another interesting plastic (useful as a glass sheet interlayer), disclosed by Pittsburgh Plate Glass Co., is a flexible sheet of polyvinyl acetal resin plasticized with an ester of a dihydroxyethyl ether alcohol containing 2-3 ethyl groups and a mixture of **branched chain acids obtained by air oxidation of an open-chain petroleum hydrocarbon** of about 45° Be, the acids averaging 8 C per molecule, and boiling between 55-130° C./1 mm. (U. S. 2,397,612).

Selected Patents of the Month

U.S. 2,395,281 (duPont)—Ethanolamine.
U.S. 2,395,291 (Phillips Petr.)—Catalysts.
U.S. 2,395,327 (duPont)—Polymerizing ethylene.
U.S. 2,395,362 (Phillips Petr.)—Separating hydrocarbons.
U.S. 2,395,382 (Shell)—Inhibited leaded gasoline.
U.S. 2,395,457 (Lubri-Zol)—Lube containing chlorwax.
U.S. 2,395,491 (Universal Oil Products)—Separating mononuclear from polynuclear aromatics with solid adsorbent.
U.S. 2,395,503 (Stauffer Chem. Co.)—Treating acid sludge.
U.S. 2,395,509 (Koppers)—Removing organic sulfur from gas with morpholine.
U.S. 2,395,523 (Shell)—Di(tert. butyl) peroxide and tert. butyl alcohol by oxidizing isobutane in presence of HBr.
U.S. 2,395,524 (Houdry)—Porous silica.
U.S. 2,395,680 (Std. Oil Indiana)—Isomerizing light naphtha.
U.S. 2,395,713 (Atlantic Refg.)—Alkaline earth metal sulfonates.
U.S. 2,395,774 (Union Oil)—Sulfonates.
U.S. 2,395,775 (Shell)—Alkylation.
U.S. 2,395,777 (Lummus Co.)—Halogenation of aromatics.
U.S. 2,395,800 (Carbide)—Beta diketones.
U.S. 2,395,812 (Imperial Chemical Industries)—Polymers of 1-carbalkoxy-butadienes-1, 3.
U.S. 2,395,829 (Allied Chem. & Dye)—Styrene by pyrolysis of styrene resin.
U.S. 2,395,836 (Houdry)—Catalyst.
U.S. 2,395,875-6 (Jasco).—Dehydrogenation catalyst.
U.S. 2,395,889 (Socony)—Sulfurized lubricant.
U.S. 2,395,901 (Jasco)—Low temperature isoolefin polymers.
U.S. 2,395,931 (Porocel)—Decolorizing oils.
U.S. 2,395,954-9 (United Gas Improvement Co.)—Recovering olefins and diolefins from hydrocarbons.
U.S. 2,396,036 (Std Oil Dev. Co.)—Shale distillation.
U.S. 2,396,050 (Std. Oil Dev. Co.)—Anti-skinning agent.
U.S. 2,396,054 (Stanco)—Insecticide.
U.S. 2,396,144 (Shell)—Alkylation.
U.S. 2,396,156 (duPont)—Metal deactivator.
U.S. 2,396,157 (Texas)—Catalyst regeneration.
U.S. 2,396,173 (Phillips Petr.)—$AlCl_3$ conversion of hydrocarbons.
U.S. 2,396,191 (Cities Service)—Ester-polymer instrument lubricant.
U.S. 2,396,198 (Texas)—Alkylation.
U.S. 2,396,201 (Phillips Petr.)—Acetyl cyanide.
U.S. 2,396,206 (Shell)—Methylation of olefinic hydrocarbons.
U.S. 2,396,217 (Shell)—incorporating alkyl radicals with peroxides.
U.S. 2,396,223 (Lubri-Zol)—E. P. lubricant.
Can. 433,034-9 (Shell)—Corrosion preventive.
Can. 433,043 (Std. Oil Dev. Co.)—Isomerization.
Can. 433,044-5 (Std. Oil Dev. Co.)—Spectrograph.
Can. 433,047 (United Gas Improvement Co.)—Hydroxy diarvl substituted ethane.
Can. 433,157 (Shell)—Epoxide ether.
Can. 433,163-70 (Std Oil Dev. Co.)—Isomerization.
Can. 433,171 (Std Oil Dev. Co.)—Absorption spectra investigating apparatus.
Austral. Appl. 219 (duPont)—2-Butinediol-1,4.
Austral. S.P. 120,630 (Distillers Co.)—Sulfation of propylene.
Br. 574,309 (Imperial Chemical Industries)—Coating metal surfaces with polythene.
Br. 574,515 (Houdry)—Treating gels.
Br. 574,800 (Shell)—Metal sulfide catalysts.
Br. 574,738 (Std. Oil Dev. Co.)—Methylation of aromatics.
Br. 574,678 (Texaco)—2, 3-dimethyl butane.
Br. 574,694 (Universal Oil Products)—Branched chain paraffins.
Br. 574,839 (Std. Oil Dev. Co.)—Butadiene separation.
Br. 574,958 (Shell)—Controlled catalytic oxidation.
Br. 574,939 (Std. Oil Dev. Co.)—Isomerization.
Br. 574,892 (Universal Oil Products)—Conversion.
Br. Appl. 20,500/45 (Lubri-Zol)—Lubricants.
Br. Appl. 35,000/45 (Shell)—Vinyl chloride.
Br. Appl. 857/43 (Std. Oil Dev. Co.)—Polymerizing olefins.
Br. Appl. 19,545/45 (Shell)—Catalytic cracking.
Br. Appl. 13,380/42 (Std. Oil Dev. Co.)—Isomerization.
Br. Appl. 14,313/45 (Shell)—Dehydrogenation.
Br. Appl. 2597/43 (Texaco)— 2, 3-dimethyl butane.
Br. Appl. 19,225/43 (Universal Oil Products)—Branched chain paraffins.
Br. Appl. 32,455-8/45 (Shell)—High molecular unsaturated substances containing more than one unsat. grouping in the mol. with inorganic acids or anhydrides.

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N.G.A.A. PAPER

TODAY'S OPPORTUNITIES FOR NATURAL GASOLINE AND CYCLING INDUSTRIES

By J. H. Dunn
President, Shamrock Oil and Gas Corp.

The present problems of the natural gasoline manufacturers and of the related cycle plant operators arise (1) from the surplus of their volatility materials for motor fuels, the butanes, and (2) from the fact their natural gasoline products are burdened with high-cost rail transportation.

Under present refining practices it is said the potential surplus of butane from refinery sources alone will average 50,000 b/d. However, the expanding LPG markets are seen as future outlets for a large proportion of the butanes and propanes from the natural gasoline and related plants.

The trend toward greater movement of natural gasoline products by pipeline may make it possible for refiners to consider these products on a competitive basis with their other large-volume raw material, crude oil. This trend will be emphasized as the cost of naturals to the refiner reflects the lower transportation cost by pipeline. The natural gasoline manufacturer must stand ready to furnish products to the refiner's desired specifications.

JUST a quarter century ago the representatives of 31 companies producing liquid products from natural gas in the Mid-Continent area met in Tulsa to discuss their problems. The Association of Casinghead Gasoline Manufacturers was born at this meeting April 22, 1921.

The problems of the industry seemed colossal. We are told, at that time, there were over 100 different grades of raw casinghead gasoline being manufactured. Yet the products being offered submitted to no man's specifications. There were not only demands for standard specifications in order that the seller could furnish the buyer with the products he desired, but there were also demands for transportation rules and regulations for safe practices in handling. Regarding the products themselves, the remarks of D. E. Buchanan at this first meeting are illuminating and are quoted in part from the recorded minutes as follows:

"We should not be ashamed of the stuff we make. It has an end point and an initial that no other petroleum product has and yet only three or four of the concerns represented in this room advertise it. The rest of you call it something else. Too many refiners and marketers don't know what blending is and a lot of others wouldn't have a car of our stuff on their tracks. They wouldn't sleep well if they knew it was there. What we need is some well directed publicity and an educational program to tell these people what can be done with our stuff."

Some of those remarks by Mr. Buchanan might well be reproduced as of today.

During the intervening 25 years we have seen many accomplishments benefiting the whole industry. The value of natural gasoline as a blending material was proved beyond any doubt through sponsored research programs. Technical Standards created by NGAA Committees are recognized as invaluable criteria for the testing and measurement of the products manufactured.

In this industry, as all others, new problems take the place of old ones and it always seems that the new problems are more complex and difficult of solution. The industry continues to render an invaluable service in the elimination of waste and the conservation of petroleum products. In its program the industry has expanded its operations to include greater conservation activities by its participation on a broad scale in cycling and pressure maintenance projects.

As natural gasoline went to war there were material increases in the production of propane, butanes, and cycle stocks (Fig. 1). This situation resulted from greater diversification in demand, and brought about the expansion of facilities for the manufacture of special products for special uses through the more extensive separation of the light ends. These raw materials became important for the manufacture of such products as butadiene, alkylate, cumene, toluene, and 100-octane gasoline.

It is of great significance to the industry to learn by this experience and through an expanding market for liquefied petroleum gas that it has something more to sell than plain volatility to the refiner.

This paper was presented at the 25th Anniversary Convention of the Natural Gasoline Assn. of America, April 18, Dallas, Texas, under the title "Plans and Opportunities for the Natural Gasoline and Cycling Industries". J. H. Dunn is president of Shamrock Oil and Gas Corp., and president of the N.G.A.A.

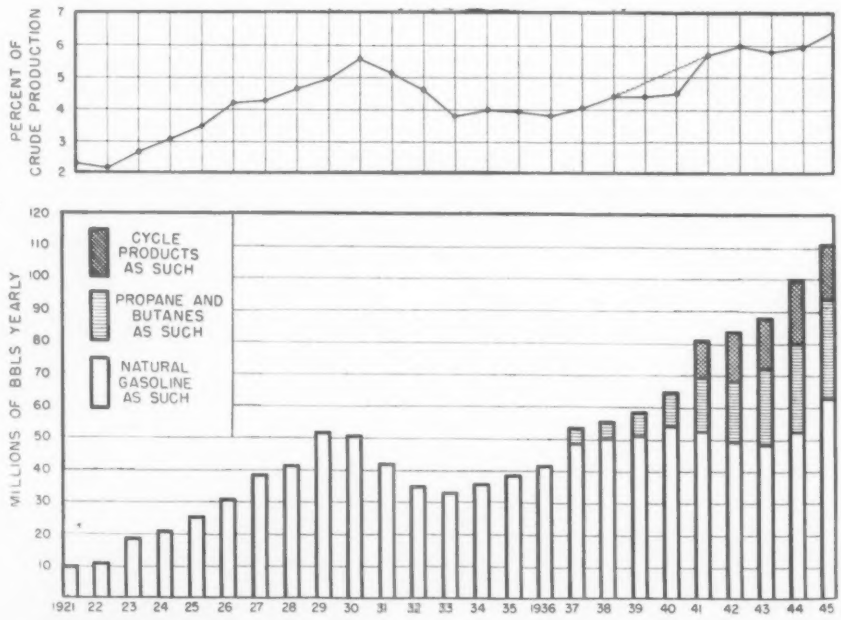
PERCENT OF CRUDE PRODUCTION
MILLIONS OF BBLS YEARLY
CYCLE PRODUCTS AS SUCH
PROPANE AND BUTANES AS SUCH
NATURAL GASOLINE AS SUCH
1921 22 23 24 25 26 27 28 29 30 31 32 33 34 35 1936 37 38 39 40 41 42 43 44 45

Fig. 1—Growth of the natural gasoline and allied industries 1921-1946

This seems to be particularly important at this time as refinery process engineers continue to design facilities to increase the cracking of heavy products into light ends with the tendency to disregard the desirability of balancing the total available supply.

The statistics show that for the year 1945, the production of natural gasoline and all related products amounted to a total volume of 111,000,000 bbls., which we estimate to have had a composition as given in Table 1.

These figures provide an interesting analysis of our present stock in trade, and indicate the future possibilities for packaging the stock to best fit the changing markets. We still must rely upon the refiner as the principal customer for our products, but it seems we must offer something more than mere volatility. Over a period of 25 years his problem has changed from volatility to anti-knock performance. The heavy gasolines of the early '20's have given place to light materials because the refiner has had to crack and reform and now catalytically crack, in order to stay in the race for anti-knock quality. With every barrel of thermally cracked gasoline, there is produced 2.8 gal. of butanes in excess of average vapor pressure requirements. The corresponding figure for catalytic cracking is 6.7 gals.

With more and more cracking, so that over 50% of the nation's post-war motor fuel will consist of cracked material, it is easy to see that refiners collectively will have a big supply of butanes. The light straight-run gasolines and the butane-free naturals will have no room for blending additional butane. Reliable estimates indicate that under present refining practices the potential surplus of butanes from refinery sources alone will, during the next few years, average 50,000 b/d. This is over and above the production from our industry.

Our problem, therefore, is to find out what can be done with the butanes which we fractionate from our natural gasoline and which the refiner normally will not need for volatility. This brings me to one really bright spot in our future. In the period 1937 to 1945, inclusive, the volume of Liquefied Petroleum Gas sales has increased more than seven-fold (Fig. 2). This increase does not include large volumes used for synthetic rubber and aviation fuel. There was a steep rate of increase during the war years but this increase was in spite of, rather than because of the war, as war time limitations prevented an even greater expansion of the industry. As steel becomes more readily available in the future, it is not unreasonable to predict that within the next five years the total volume of LPG sales will increase 100% over present levels of 1,100,000,000 gals. annually.

With good fractionation in our plants, we can serve all phases of the expanding LPG business. Not only can we produce suitable domestic fuels which will bring better living standards to rural homes, but we can produce industrial fuels and chemical raw materials. We should not overlook the needs of an important sister industry, namely, natural gas. This offers great possibilities for expanding markets. Most of the large natural gas transmission systems are confronted with increasing demands beyond their capacities. With the further rapid decline of gas supplies in the Appalachian and Great Lakes states, this shortage of capacity, in certain instances, will become even more acute. Already some of these lines are finding it expedient to increase their capacity by enriching the gas stream with propane or propane and butane mixtures. With many natural gas rate schedules and contracts based on total heating values, this practice will probably be expanded.

Further, the natural gas distributing companies are confronted with peak demands beyond the capacity of their lines, and either they or their large industrial customers are in many cases installing propane-butane standby equipment to handle such peak demands. Obviously, then, the natural gasoline industry stands between natural gas on the one hand, and liquid petroleum products on the other hand. There is no reason why we should not look both ways in seeking outlets for those of our products which, under certain conditions may be either gas or liquid.

I have already shown how the refining industry collectively will have a potential surplus of volatility in the next few years. We can channel our butanes along with propane into expanding LPG markets, and our chances of selling our products to the refiner should be much better if we can offer for his use a butane-free gasoline. In other words, we must offer something besides volatility. Through special fractionation we can offer the refiner isopentane which will improve both volatility and anti-knock performance, and is especially needed for the manufacture of aviation gasoline.

Assuming now that we are to have markets for propane, butanes, and at least some of our isopentane, we must then look for ways to dispose of the remainder. De-isopentanized natural for ordinary blending is a case in point. Most natural gasoline fractions are superior to normal refinery fractions in lead response. This superiority can be enhanced by the use of the comparatively new de-sulphurization processes. To illustrate with a specific example, a certain 10 lb. de-isopentanized natural sweetened by conventional methods shows a lead response of 6 octane numbers for one c.c. per gallon and 12 octane numbers for three c.c. The same material, de-sulphurized, shows an increase of 10 octane numbers for one c.c. and 18 octane numbers for three c.c.

We have long contended we could, if forced to do so, enter the finished motor fuel market. We are in a better position to take this course than ever before, and some plants now can do it with relative ease. Others may be forced to arrange for blending stocks for use with their butane-free natural gasoline in order to obtain

TABLE 1—Components of Natural Gasoline and Related Products in 1945

Component	Million Bbls.
Propane	10.3
Butanes	36.7
Butane-free gasoline	61.7
Heavier	2.3
Total	111.0

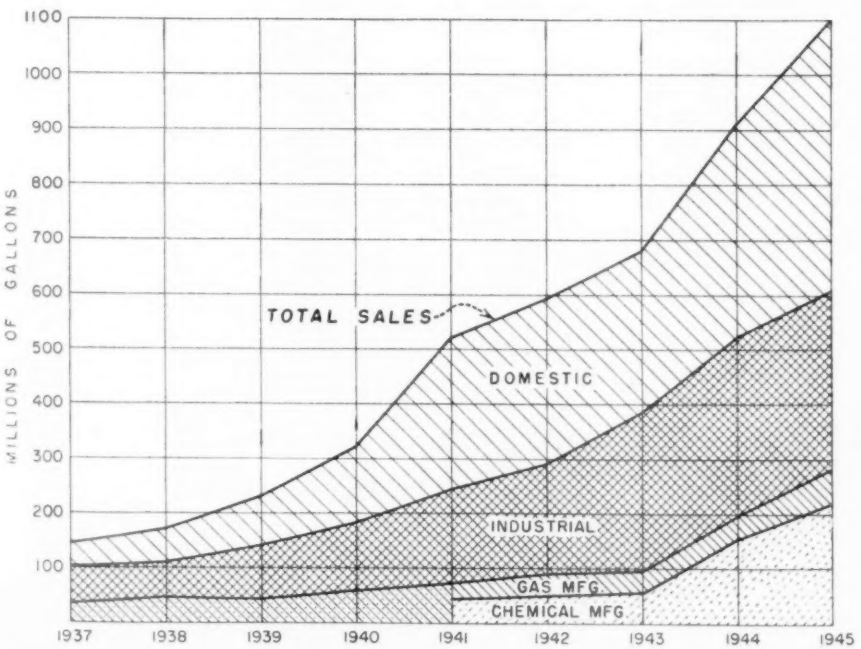

Fig. 2—Volume of Liquefied Petroleum Gas sales, 1937-1945. (Data from U. S. Bureau of Mines reports)

through the direct sale of motor fuel a satisfactory market. The cycle plant operator is even better situated to go direct to the motor fuel market, if necessary, because his stocks usually can be converted to a high quality finished motor fuel by fractionating, and it is not necessary for him to make outside arrangements for blending stocks (Table 2).

These gasolines are not conventional in the sense that they do not conform to the usual specifications written by refiners. However, many of us know from experience that these fuels can be marketed with good consumers acceptance. Indeed the problem of maximum volatility is one which might well be further investigated by this industry. We should have down-to-date information on the maximum fuel volatility limits of later model cars, and particularly with respect to highly volatile butane-free blends. In short, we need to study, by an adequate program of road tests, not the present day conventional refinery products, but the sort of finished motor fuels that can be made from our light materials. If we are forced to compete with the refiner we must be in position to refute any inference that our so-called "unconventional" fuels are not good fuels.

Among the various war time processes used in the manufacture of aviation gasoline, perhaps the most important and the one which seems most likely to survive under competitive peace time conditions, is alkylation. It is expected that the present limited demand for isobutane for this purpose will increase with the normal expansion of the peace time aviation gasoline market. Under certain conditions, alkylate may also be used in motor fuel. The natural gasoline plant operator who finds it to his advantage to consider the installation of alkylation facilities can produce the necessary unsaturates by thermal

TABLE 2—Quality Motor Fuels from Natural Gasoline Sources

	1 30%, 10 lb. Natural plus 70% Cracked Naphtha (Desulfurized)	2 Cycle Stock A	3 Cycle Stock B
Gravity, °A.P.I.	63.4	64.9	68.7
Vapor Pressure, Reid	7.4	7.5	8.0
ASTM Distillation, °F.			
I.B.P.	118	113	106
10%	140	140	136
20%	154	149	149
30%	168	160	164
40%	186	175	185
50%	214	189	206
60%	242	204	231
70%	268	221	259
80%	312	248	293
90%	354	281	328
E.P.	398	367	386
Recovery, %	98	97	98
Loss, %	1.0	2.0	1.0
Octane No., ASTM			
Clear	61.4	67.0	59.0
+1 ml. TEL/gal.	70.8	76.0	70.0
+2 ml. TEL/gal.	74.5	81.0	76.9
+3 ml. TEL/gal.	76.3	...	79.4

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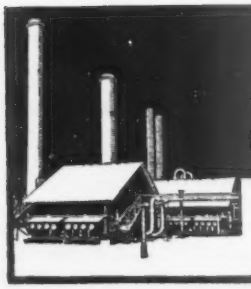

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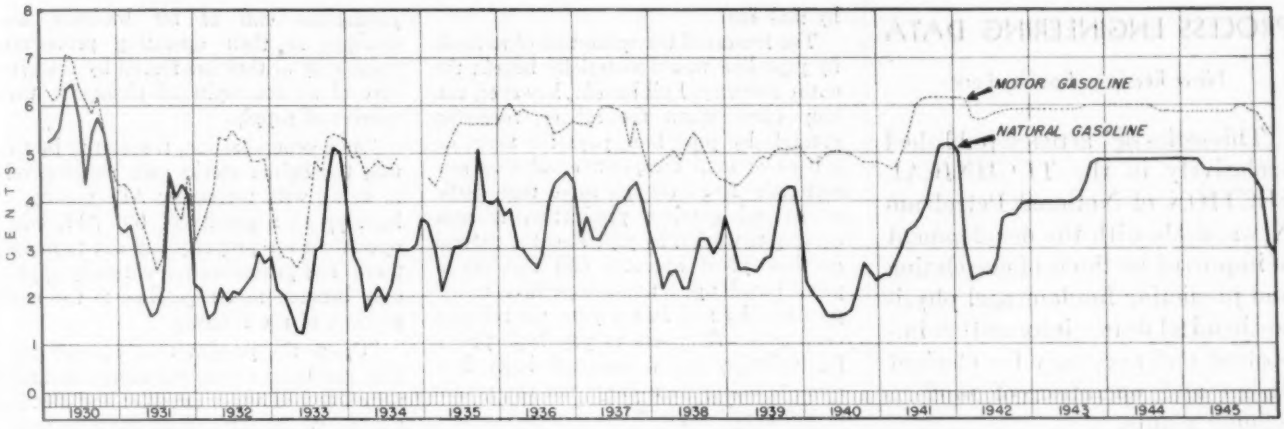

Fig. 3—Monthly average prices for natural gasoline and motor gasoline in cents per gallon, 1930-1945. Price for natural gasoline is Group 3 market, 26 lb. or equivalent basis; for motor gasoline the Midwest tank car market for regular grade. (Figures from Platt's Oil Price Handbook)

or catalytic processing of normal butane. Though alkylation and the related operations may be applied in only a few cases, such applications will tend to eliminate surplus volatility and to effectively contribute to the balancing of supply and demand.

That such a balancing of supply and demand is urgently needed becomes obvious when we review the price fluctuation of our industry (Fig. 3). I think it safe to say that no petroleum product has had to suffer the erratic and wide variations of price that have been the lot of natural gasoline. By way of brief review, we may first recall the prosperous '20's when prices ranged up to 12.0 cents per gallon (I pause so that you old-timers may get your handkerchiefs into play), and when a low of about 4.5 cents in April, 1927, threw consternation into the industry.

Next, we contemplate the record of the Depression Decade, a time when any resemblance between the price of natural, and of motor fuel came to be purely a coincidence. This period culminated in 1940 with the Group 3 price of natural averaging less than 2 cents per gal. well below the value of crude oil.

In 1941, under the spur of war time demand, refiners were quick to recognize that a barrel of good aviation base stock could be recovered from natural with less expenditure for manpower and equipment than for the same barrel made from crude oil. By the year end, natural was above 5.0 cents, Group 3, for the first time in 8 years. Now by contrast, the current market trend is very similar to 1940 conditions.

Let us look at some factors responsible for these fluctuating markets. The greatest economic handicaps which natural gasoline has had in the past have been (1) cost of transportation, and (2) seasonal demand necessitating expensive periodic storage. Crude oil has throughout the past 25 years and longer moved to refinery markets by pipe line. On the other hand, natural gasoline has been burdened with high cost rail transportation. (Quoted markets being based entirely upon tank car shipments).

About eight or ten years ago, some more enterprising refiners, partly at the insistence of their own natural gasoline departments, started moving natural by pipe line in blend with crude oil. These refiners soon learned that the higher vapor pressure material could be handled without appreciable losses, and that the reduction in viscosity, in most cases, increased the total capacity of the pipe line so as to, in effect, give the natural gasoline a "free ride." The only charge to be made against the saving in transportation cost is, therefore, the negligible cost of handling the extra material through the primary distillation process at the refinery.

In recent years there has been an even greater development in the transport of natural gasoline in clean lines. Special lines are usually provided for the transport of natural gasoline to refining centers where production volumes are concentrated in sufficient quantities to justify such facilities. Examples of these cases are East Texas, Texas Panhandle, Southern California, and the Permian Basin of West Texas and New Mexico.

Statistics show that during the later war years, PAW Districts 2 and 3 produced about 88% of the total natural gasoline and related products produced in the U. S. Statistics also show that the pipe line transportation of these products in Districts 2 and 3 increased to the extent that nearly 70% of the production in these Districts moved by pipe line, of which about 20% was transported in crude lines and nearly 50% was transported in clean lines (Fig. 4). It is significant to note that the volumes transported in crude oil lines alone exceeded the volumes transported

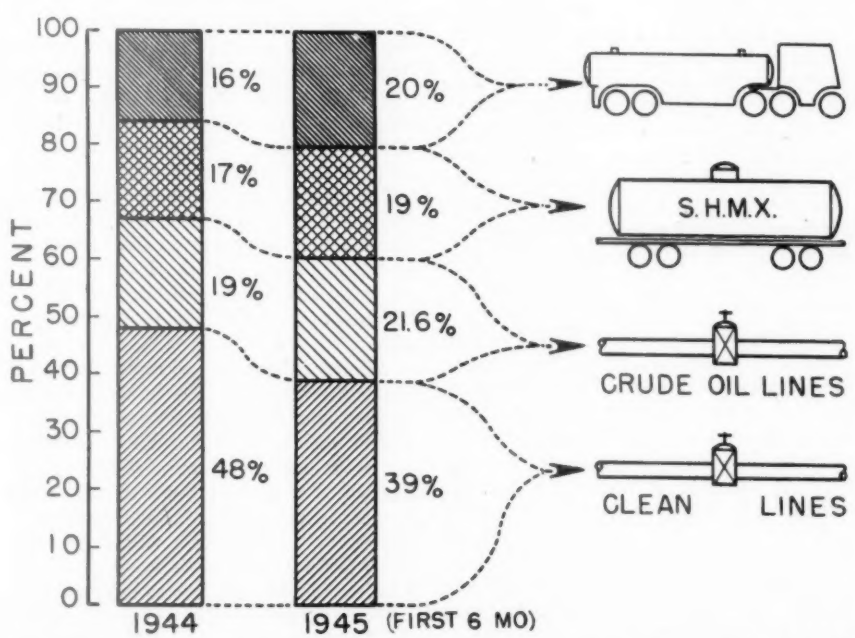

Fig. 4—How natural gasoline and allied products were transported in PAW Districts 2 and 3 during the latter part of the war period

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by tank car.

The increased transportation of naturals by pipe line would materially benefit the entire industry. Full benefit, however, can only come when the refiner, receiving naturals by pipe line, pays for them on a basis of their competitive value as raw materials. Even though more than 50% of natural gasoline production is now moving to market by pipe line, the natural gasoline plant operator still receives a price based upon non-competitive transportation by rail. In the past, the refiner's need and willingness to pay high prices for volatility on a seasonal basis had some tendency to average out the return to the gasoline plant.

I must direct your attention to the importance of pipe line transportation and commodity value to our industry in the face of recent changes in the supply and demand for volatility. The trend toward greater pipe line movement of natural gasoline products may make it possible for the refiner to consider these products on a competitive commodity basis. If the refiner can do this, the natural gasoline plant operator must stand ready to furnish products of the specifications desired. He must then develop other markets for his surplus volatility. On the other hand, if such pipe line markets are not provided, and he is to survive in a competitive field, he must avail himself of some direct approach to the markets.

Because of my interest in the subject I have been greatly impressed by the remarks of Colonel Ernest O. Thompson, Member of the Railroad Commission of Texas, which pertain to the production and utilization of light hydrocarbons, and which were part of his address March 26, 1946 before a meeting of the Western Petroleum Refiners Assn. in Fort Worth. Some of you heard Colonel Thompson's address and others have read its reproduction the same as I have, but those remarks which I wish to quote now will bear repeating over and over and over again. These quotations are as follows:

"We intend to see to it that the gas produced with oil is either returned to the reservoir to maintain the reservoir pressure or to see to it that the liquid contents are first saved and then the gas is put into transmission lines for use in domestic, commercial or industrial use—gas wastage is going to be stopped in this state.

"Unless refiners realize that the production of these light hydrocarbons is to be a really major factor in the industry, and unless they plan their operations to utilize these light hydrocarbons to advantage, loss will be suffered both by them, in the delay in realizing the profits that can come out of converting these light hydrocarbons to maximum value, and by the producers of the light hydrocarbons, since they will not receive prices comparable with the true value of the materials they are producing.

"Characteristically, refiners are sometimes unfamiliar with the trends of the production end of his business, and changes in their operating procedures come only as they are forced by the pressure of an accomplished change in their sources of supply.

"As a generalization, it seems to be true that the lighter stocks gain progressively in value with increasing API gravity, at least up to a gravity of 60° API, when operations are properly laid out to handle them. The generalization naturally applies only because motor gasoline is the main product of the industry.

"Up to the present time natural gasoline has been consumed almost entirely, for control of vapor pressure and distillation range, as a blending agent in motor gasoline. In this use it has been a rather essential component of the finished gasolines. However, the demand has, as you know, fluctuated greatly with seasonal vapor pressure requirements. The increasing production of natural gasoline will make the available quantity far greater than can be consumed for this purpose, and other means of converting it to a final marketable product will be necessary.

"So I plead with you—plan to utilize these lighter hydrocarbons that are surely going to be made more and more abundant by our more rigid conservation practices.

"The Railroad Commission of Texas is determined to do its full duty in stopping flares of casinghead gas. These gases will furnish more and more your raw material.

"Public opinion . . . will demand that the products of conservation, which these raw materials are and which the greatly enlarged quantity will be, should be used first in making motor fuels and that the crude oil in the reservoir shall be brought forth only in sufficient quantities to make up the difference."

I wish to say that I have quoted freely from Colonel Thompson's address because he has done a better job of analysis and the presentation of many of our problems and their solution than I can do. He has in his address suggested that the proper yardstick of conservation may be a total hydrocarbon balance of supply and demand. We must remember, however, that the solutions are relatively simple to state, but the balanced picture can be extremely complex to accomplish. It can only be done by intelligent application of the resources available to the individual operator.

I believe that true and real conservation can be accomplished only with the full utilization of the lighter hydrocarbons produced with crude oil and natural gas. I hasten to say also that it is my opinion that when economically transported, these raw materials, on the basis of their commodity value, will yield to the producer a fair and satisfactory return. And, finally, I believe as Mr. Buchanan believed back in 1921 that we should tell people "what can be done with our stuff," and further, that we should be prepared to demonstrate it.

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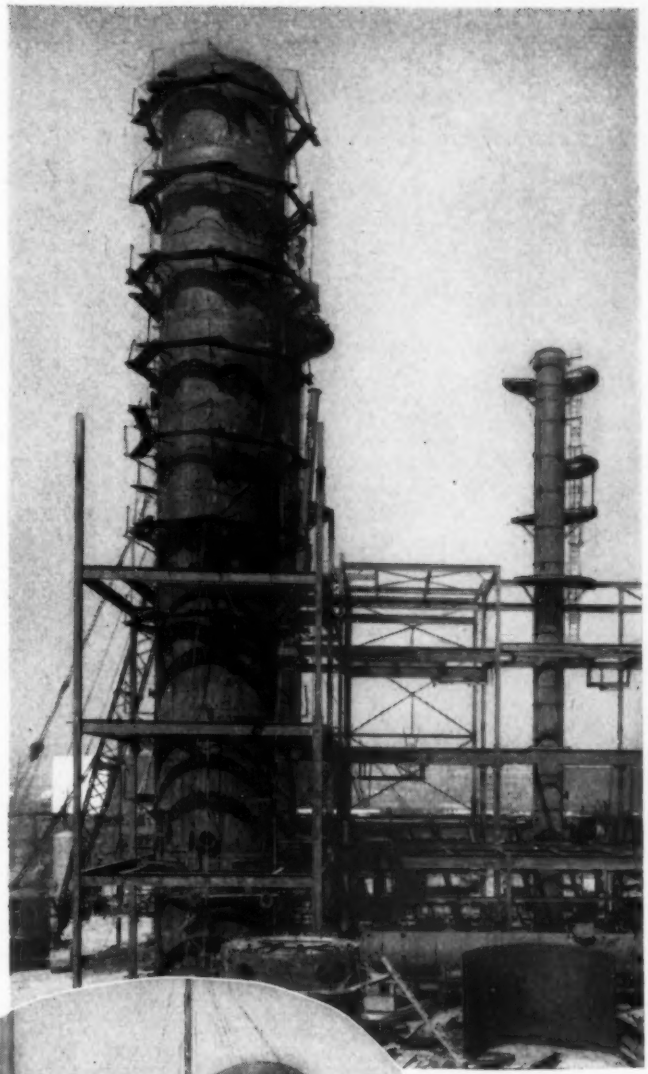
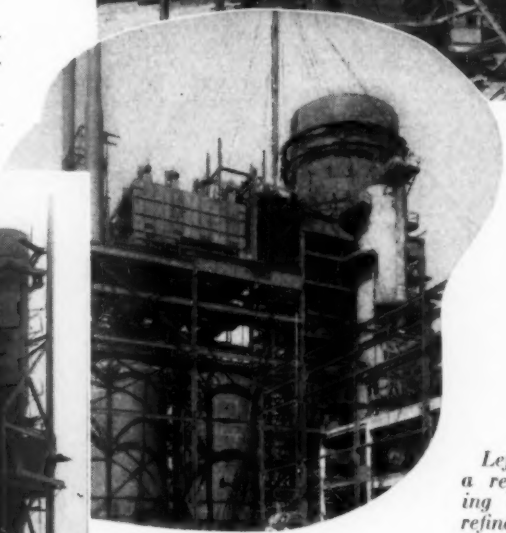


Above: The large cracking tower at the left in this photo is 14 ft. in diam. by 98¾ ft. high.



Left: This view shows a regenerator tower being erected at a large refinery. It is 42⅓ ft. in diam. by 87½ ft. high.

Left: Two 30 ft. diam. by 73 ft. catalyst bins, one 22 ft. diam. by 91 ft. reactor and one 15 ft. diam. by 90½ ft. reactor under construction.

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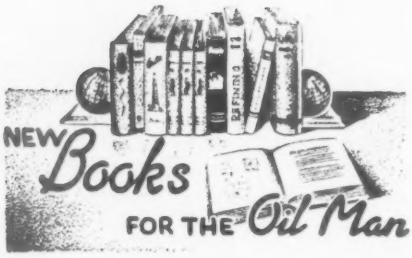

Copies of all books reviewed on this page can be ordered from the Book Department of *National Petroleum News*, 1213 West Third St., Cleveland, 13, for the prices listed, postpaid. Ohio purchasers please add 3% tax.

Operation of HF Alkylation Plants Is Reviewed

Hydrofluoric Acid Alkylation, a Phillips Petroleum Co. publication; 6 x 9 in., 365 pages, including illustrations, flow charts and Appendix, stiff cloth binding, $7.50.
NOTE—This book sold only through Chemical Products Dept., Phillips Petroleum Co., Bartlesville, Okla.

A complete compilation of information on the Hydrofluoric Acid alkylation process as based on the operation of three wartime plants, as well as research and development work is now generally available. Previously, due to wartime secrecy requirements, this data was available to only actual HF Alkylation Plant operators. It was presented through a series of 17 restricted reports issued by Phillips Petroleum Co., which became known as the "Blue Books."

The original policy in presenting the reports was to give complete details of the process, laboratory analyses, equipment operation and so on, rather than to report in generalities. This policy has been followed in the new single volume since it is felt that this type of detailed information is of more value to plant operators than general principles.

Information pertaining to the corrosion of metals by hydrofluoric acid, as experienced by Phillips Petroleum Co., is correlated in one chapter. Early pilot plant data regarding resistance of various metals of construction and specific items of equipment are also summarized. A compilation of analytical methods particularly applicable to HF alkylation, with pertinent literature references, is given in another chapter. Included are the general analytical methods that have been adapted for use in connection with HF alkylation. Safety working procedures are detailed. One chapter is devoted to describing the operation of the HF unit installed by Champlin Refining Co. at its refinery at Enid, Okla.

A catalytic isobutylene-butylene copolymer was found suitable for alkylation in the operation of the Borger, Texas, unit of the Phillips company. The co-polymer was produced by polymerizing 64.6% of the total olefins in the butane-butylene stream, which was charged to a catalytic polymerization unit using silica-alumina catalyst. The co-polymer was made, during an inspection period, from butylenes which normally would have been alkylated and was stored without fractionation or other treatment. When the unit resumed operations, the co-polymer was blended into the normal alkylation feed, with no apparent changes from average operation.

Explains Many Applications Of Electronic Equipment

Electronic Equipment and Accessories, by R. C. Walker, 5¾ x 8¾ in., 393 pages, stiff cloth binding, indexed and illustrated, $6.00.

Electronic Equipment and Accessories does not have any direct reference to applications in petroleum refining. It does, however, cover many phases of electronics and electronic equipment, such as uses of cathode ray tubes, control devices, switchgear and relays. Much attention is given to light sensitive devices. It is written to present the subject of electronics to practical engineers, mechanics, and others who have at least a basic knowledge of the elements of electricity and magnetism.

Advantages and disadvantages of circuits and equipment are given and economic value of electronic operated devices vs. mechanical devices is discussed. It deals mainly with the use of electronics outside the field of telecommunication.

The book covers theory and application of thermionic valves, power and voltage amplification, light-sensitive devices and their uses, the cathode ray tube, delayed-action devices, impulse recording or counting equipment, small motors including selsyn control, various types of relays, and power supplies and voltage regulators.

R. C. Walker, the author of *Electronic Equipment and Accessories*, is not identified in any manner in the text, which appears to be of either British or Canadian origin, although no mention is made to that effect.

Helpful Trade Literature

Handbook of Stainless Steels: 100-page pocket size handbook containing data on 26 types of stainless steels, a 44-column finder table, corrosion resistance to 230 materials, discussions of properties, products, available forms and sizes, and fabrication methods. Allegheny Ludlum Steel Corp., Brackenridge, Pa.

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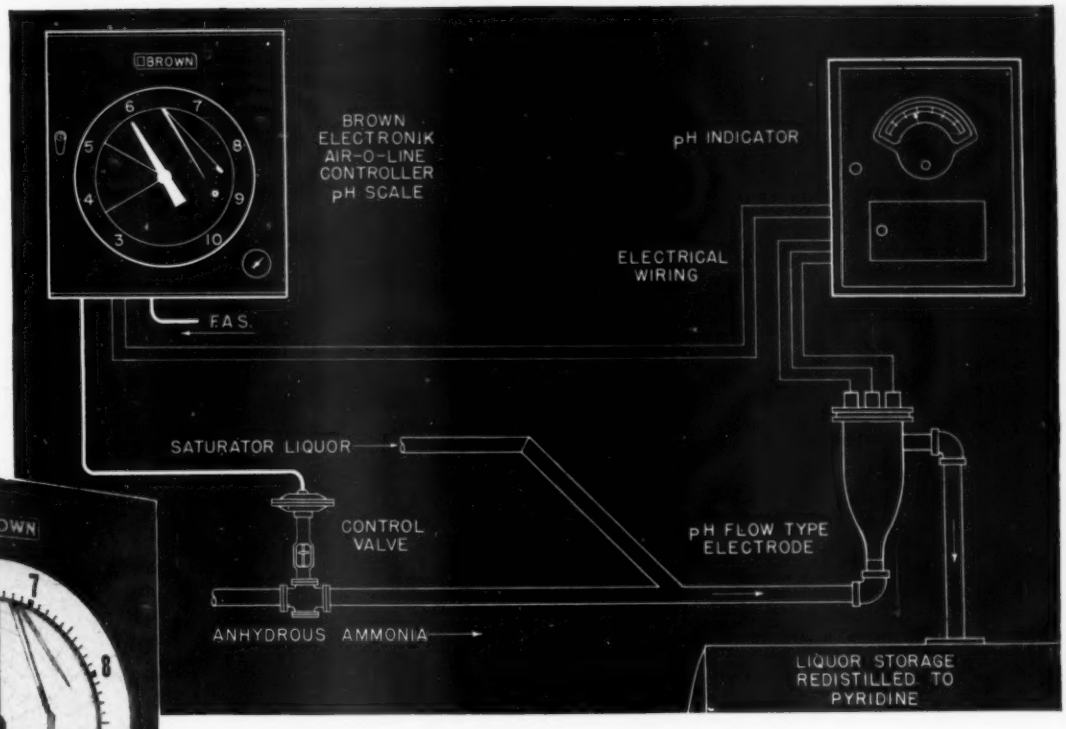

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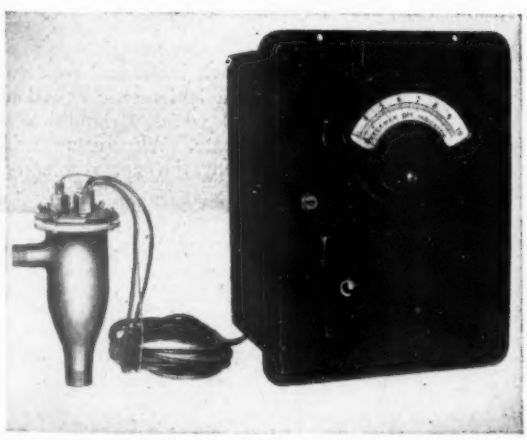

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BROWN *Electronik* POTENTIOMETERS

Principles of Reactor Design

ARTICLE NO. 2
PYROLYSIS OF PROPANE

By P. S. Myers and K. M. Watson
University of Wisconsin, Madison

Data from the literature for the pyrolysis of propane and its products are analyzed and rate equations are developed for ten reactions which contribute significantly in determining the rate and product distribution of this operation. By simultaneous integration of these ten equations the results obtained in any specified reactor arrangement may be predicted. This procedure is demonstrated for the laboratory conditions of the investigations described in the literature and also for a design study of a commercial-scale plant involving prediction of temperature gradients and pressure drops. The results are in satisfactory agreement with the data in the literature. However, analysis of reliable data from an operating commercial plant is desirable for verification of the equations developed.

THE process design of an optimum reactor for the high temperature pyrolysis of an organic material requires the prediction of conversions and product distributions resulting from combinations of widely varying temperatures, pressures and space velocities. Because of the large number of simultaneous and secondary reactions which generally occur, these relationships become very complex and direct correlation of overall results with the operating variables is difficult. This problem is particularly serious in attempting to apply laboratory and pilot plant data taken at essentially isothermal-isobaric conditions to the design of large-scale equipment in which both temperature and pressure may vary widely.

A scientific approach to this problem would be to isolate and study the effects of each individual reaction occurring in the complex system and develop a fundamentally sound expression for its rate in terms of the controlling conditions and compositions. It is belived that any complex reaction can be resolved into individual steps, each of which is of simple order having a rate expressed by the relatively simple equations of the Eyring[8] theory of reaction rates. Once such fundamental rate equations were available for each reaction taking place the results produced in any reactor operating at any selected conditions could be predicted by a progressive integration of the type demonstrated by Reiser and Watson[14].

The application of such a sound, fundamental approach to pyrolytic reactions is made difficult by the generally accepted evidence that these reactions are of the chain type involving the intermediate formation of free radicals whose concentrations determine both the rates and the courses of the overall reactions. By analysis of the data on the formation of HBr by a chain reaction of hydrogen and bromine Hougen and Watson[9] have shown that the rates of such complex reactions can be satisfactorily represented over wide ranges of conditions by a group of rate equations applicable to fundamental reactions of simple order. However, even for such a simple system as the HBr synthesis, the analysis is very tedious because of the unknown concentrations of the free radicals which must be evaluated.

It is hoped that ultimately it will be possible to develop simplified methods which will permit practical handling of chain reactions in terms of the free radical mechanisms believed to actually occur. At present this approach appears too tedious to be of value and there is a place for semi-empirical design relationships which may be applied to specific systems over moderately wide ranges of conditions.

It has been found that many overall pyrolytic decomposition rates approximate pseudo first order behavior in that over considerable ranges the rate is proportional to the first power of the concentration or partial pressure. Careful analysis of data[12] over wide ranges indicates that serious error may result from such an assumption. Accordingly, as an improved approximation it will be assumed that each individual reaction proceeds in accordance with its simple stoichiometric equation but with an *apparent order of reaction* which is empirically evalutated from the effect of pressure on rate. When using such apparent orders of reaction to represent the net results of

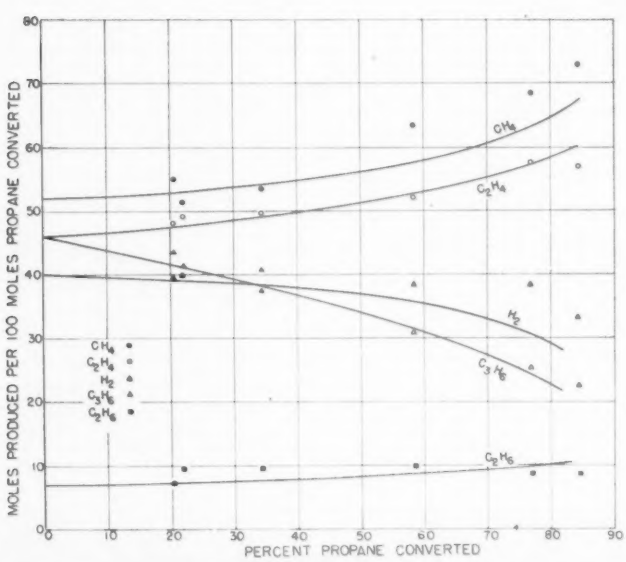

Fig. 1—Distribution of major products from the pyrolysis of propane at 725° C., 1 atm. (experimental points; calculated curves)

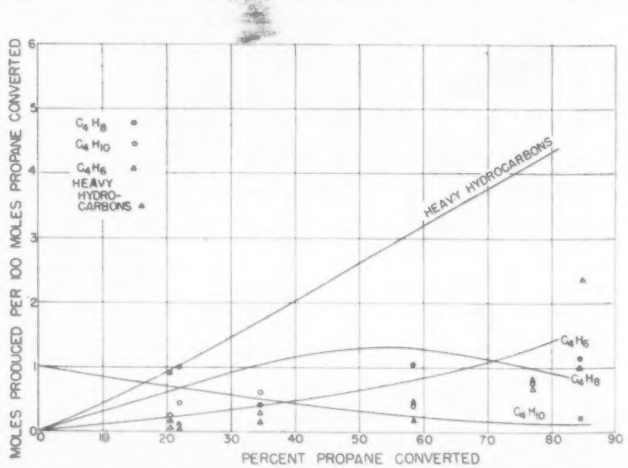

Fig. 2—Distribution of minor products from the pyrolysis of propane at 725° C., 1 atm. (experimental points; calculated curves)

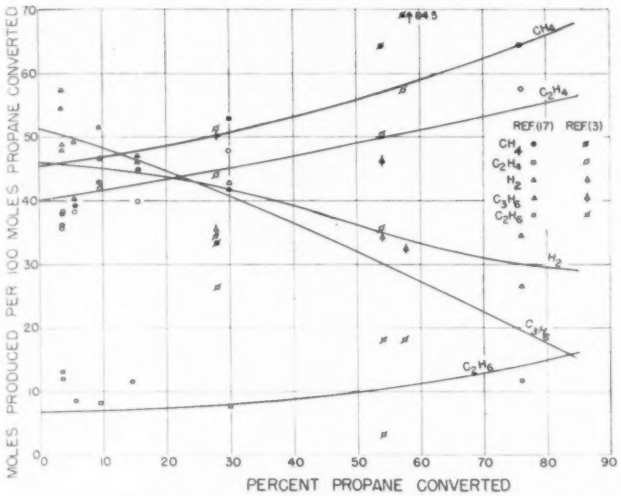

Fig. 3—Distribution of major products from the pyrolysis of propane at 650° C., 1 atm. (experimental points, calculated curves)

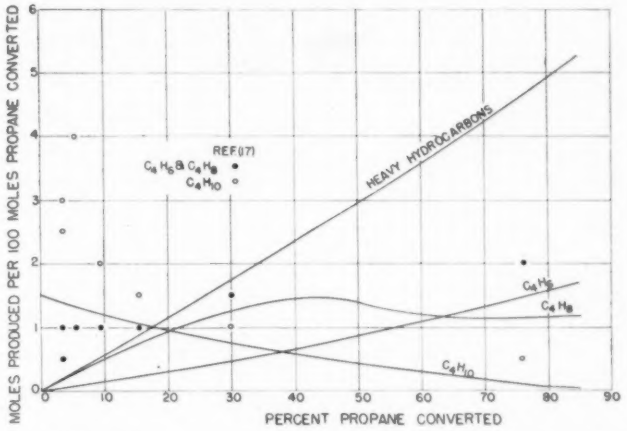

Fig. 4—Distribution of minor products from the pyrolysis of propane at 650° C., 1 atm. (experimental points, calculated curves)

series or chains of reactions it must be carefully recognized that this treatment is empirical and cannot serve as a reliable basis for extended extrapolation.

To explore the possibilities of such semi-empirical methods the pyrolysis of propane was selected for study. This system has been extensively investigated in both laboratory and plant scale operations and has the advantage of being sufficiently complex to test the methods and yet simple enough to permit evaluation of most of the products as pure compounds. The reaction is of growing industrial importance for the production of ethlyene and propylene for chemical synthesis.

Product Distribution vs. Conversion

In presenting data on complex reacting systems it is convenient to designate as *conversion* the decomposition or disappearance of the key or limiting reactant. Thus, in propane pyrolysis the percentage conversion is the net percentage of the propane fed which is decomposed and converted into other products. A tabulation of the number of moles of each product formed per mole of propane decomposed is termed the *product distribution* of the reacting system.

For the analysis of data on complex systems it is convenient to plot curves expressing product distribution as a function of conversion at constant conditions of temperature, pressure and feed composition. The extrapolation of such curves to zero conversion serves to identify the products of the apparent primary reactions. Product distributions observed by Schneider and Frolich[17] in the pyrolysis of propane at 725° C. and 1.0 atm. are shown graphically in Figs. 1 and 2. The points plotted in these figures represent the experimental data while the curves shown are calculated from the general rate equations developed in this work.

Similar results for 650° C. and 1 atm. are shown in Figs. 3 and 4, which include data of Schneider and Frolich[17] and Egloff, Thomas and Linn[3]. In Fig. 5 are product distributions from the work of Tropsch, Thomas and Egloff[19] at an absolute pressure of 725 psi, with temperatures ranging from 555 to 585° C. In all cases the curves shown are calculated from the same general rate equations.

It is evident that if only primary first order irreversible reactions were involved the curves of Figs. 1-5 would be horizontal lines and product distribution would be independent of conversion. The finite slopes of the lines result from secondary or reverse reactions or from differences in the apparent orders of the primary reactions which cause their relative rates to vary with varying partial pressures. Thus, if the apparent orders and rate equations of the primary reactions can be established from data at zero conversion under different pressuers, these relationships may be used to calculate the product distributions at various conversion levels which are attributable to the primary reactions and their reversal. The differences between the observed and these calculated distributions are attributable to the secondary reactions and serve to identify their natures and relative rates. In this manner rate equations for the secondary reactions may be developed which are consistent with those of the primary reactions.

The same type of analysis may be extended to evaluate the relative rates of tertiary reactions involving the products of secondary reactions. Thus, an entire series of relative reaction rates may be evaluated from product distribution data alone. These relative rates may be translated into absolute rates if the absolute rate of any one reaction of the group is known. In general, the absolute rates of the primary reactions are most readily determined by direct measurement and serve as the starting points from which the other rates are developed by analysis of the variation of product distribution with conversion.

Overall Rate of Decomposition

Absolute reaction rate measurements, particularly at high temperatures, are notoriously inconsistent and unreliable, largely due to the difficulty of accurately determining the true effective temperature or reactor volume as discussed by Reiser and Watson[14]. Unfortunately Schneider and Fro-

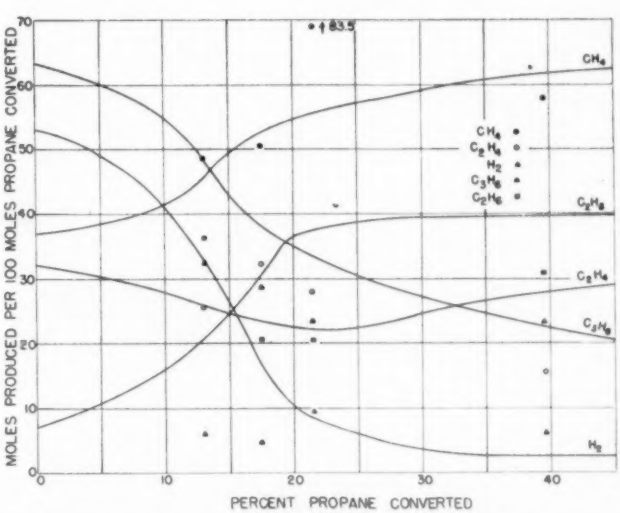

Fig. 5—Distribution of products from the pyrolysis of propane at 555-585° C., 50 atm. (experimental points, calculated curves)

lich[17], whose work on the products from propane is the most extensive reported in the literature, give no data from which absolute rates can be calculated. Conversely, those who have made careful measurements of the rates of pyrolysis do not report complete product distributions. This situation is summarized by Frey and Hepp[6] and Burk, Laskowski and Lankelma[2] in reviews of the rates of pyrolysis of the normal paraffins. These latter investigators treated the decompositions as pseudo first order reactions whose rates are expressed by the following equations:

$$r_A = k_c c_A \quad \ldots\ldots (1)$$

where

r_A = rate of decomposition of reactant A, moles/(volume) (time),

k_c = reaction velocity constant in concentration units, 1/(time),

c_A = concentration of A, moles/(volume).

The variation of k_c with temperature is expressed by the Arrhenius equation,

$$k_c = Ae^{-E/RT} \quad \ldots\ldots (2)$$

where

E = apparent energy of activation,

A = the "the apparent frequency factor".

Burk and co-workers concluded that in spite of the widely varying values of E which are reported in the literature an average value of 63,000 calories per gram-mole is in satisfactory agreement with the reliable data for all of the normal paraffins.

For the design of flow type reactors it is more convenient to express reaction rates in terms of activities or partial pressures rather than the concentrations of Equation 1. Thus, for a first order reaction,

$$r_A = k\, p_A \quad \ldots\ldots (3)$$

where

k = reaction velocity constant, (moles)/(volume) (time) (pressure),

p_A = partial pressure of reactant A.

Since for ideal gases $c_A = n_A/V = p_A/RT$ it is evident from Equations 1 and 3 that

$$k = k_c/RT \quad \ldots\ldots (4)$$

The variation of k with temperature in a gaseous system is expressed by the Eyring equation

$$k = A\, e^{-\Delta H^\circ/RT} \quad \ldots\ldots (5)$$

where

A = a factor dependent on the entropy of activation,

ΔH° = the apparent enthalpy of activation.

It is evident from comparison of Equations 2, 4, and 5 that E, the energy of activation in the Arrhenius equation, is not exactly equal to ΔH°, the enthalpy of activation in the Eyring equation, because of the occurrence of temperature in Equation 4. However, because of the uncertainty of the experimental values it was elected to take 63,000 calories per gram mole as the average value of the apparent enthalpy of activation for the primary reactions of propane pyrolysis.

In order to evaluate A of Equation 5 for the overall primary reactions, an average value of $k_c = 0.006$ 1/(sec.) at 600° C. was selected from the data reviewed by Frey and Hepp[6]. This corresponds to a value of k in (lb.-moles)/(cu. ft.) (hr.) (atm.), which is calculated from Equation 4 as 0.0188. The corresponding value of A in Equation 5 is $1.11\ (10)^{14}$ (lb.-moles)/(cu. ft.) (hr.) (atm.) with $\Delta H^\circ = 63{,}000$ cal./g.-mole. These constants establish the combined or overall rate of the primary decomposition reactions as a function of temperature.

It was concluded by Frey and Hepp that the primary decomposition rate is proportional to the first power of the pressure over considerable ranges. Accordingly, pseudo first order behavior is assumed for the combined effects of the primary reactions.

Primary Reaction Rates

Extrapolation to zero conversion of average curves through the experimental points of Figs. 1-5 establishes the product distribution resulting from the primary reactions. It will be noted that hydrogen, methane, ethylene, ethane, propylene and butane all appear as primary products by this method. Their production can be accounted for by the simultaneous occurrence of the four primary reactions numbered 1 to 4 in Table 1. The contribution which each of these reactions makes to the total rate of primary decomposition is established by the proportions in which the products occur at zero conversion.

For example, Figs. 1 and 2 indicate that at 725° C. and 1 atm. 0.46 mole of ethylene is formed per mole of propane decomposed. Since ethylene results only from Reaction 1 the rate of this reaction must be 0.46 times that of the combined or overall rate of decomposition. Similarly, Reactions 2, 3, and 4 are established as proceeding at rates equal, respectively, to 0.12, 0.40, and 0.02 times the rate of the total decomposition. Thus, the absolute rate of each of the four primary reactions is established from the total decomposition rate at these conditions.

This procedure is repeated for the data at 650° C. in Figs. 3 and 4, and absolute rates of the individual reactions calculated at this temperature. From the individual rates at these two temperatures the individual values of A and ΔH° which are listed in Table 1 are calculated. The reaction velocity constants are plotted as functions of temperature in Fig. 6.

It will be noted from the data in Table 1 that Reactions 1 and 2 have the highest apparent enthalpies of activation. As temperature is increased these reactions become more important, while 3 and especially 4 become less important.

Application of the rate constant determined in this manner

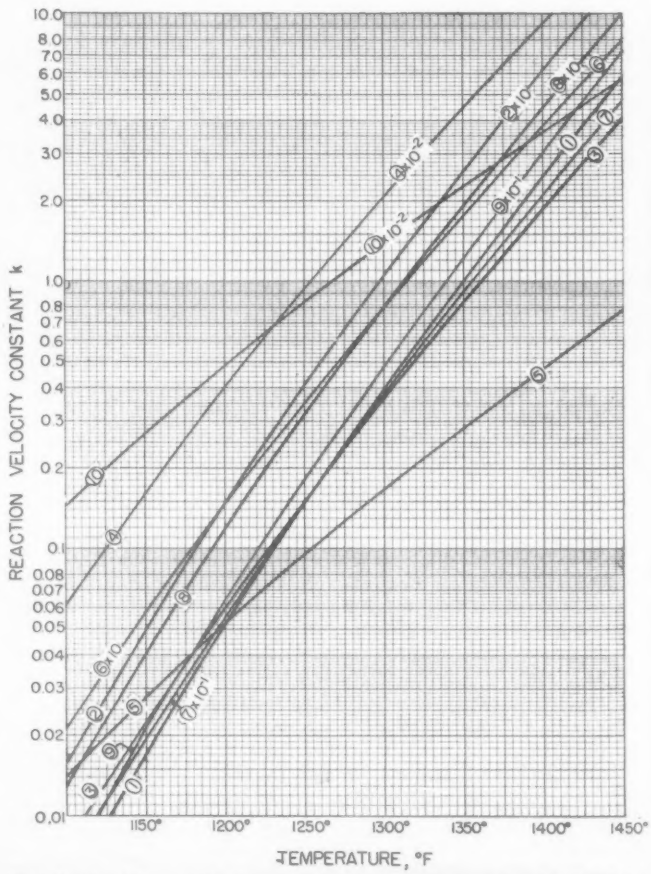

Fig. 6—Reaction velocity constants (numbers refer to Table)

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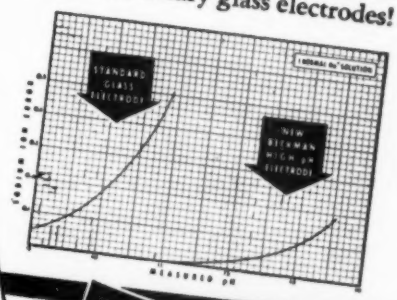

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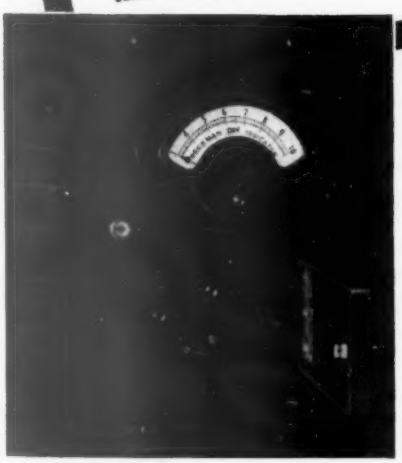

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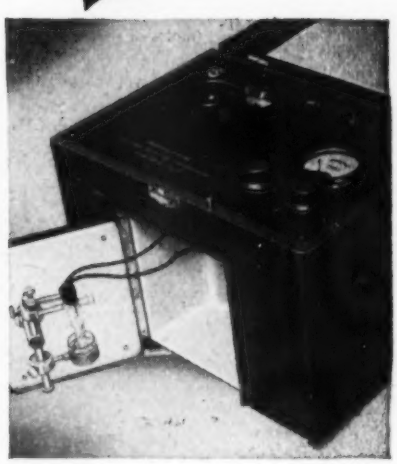

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from the data of Figs. 1-4 to the conditions of the high pressure experiments of Fig. 5 indicated a primary product distribution in reasonable agreement with the trends of the experimental data, which is rather fragmentary in the low conversion range. Accordingly, it is assumed that each of the individual primary reactions may be treated as first order in accordance with the rate equations given in Table 1.

The equilibrium constants of the four primary reactions were calcuated from the thermodynamic data of the literature(13, 15, 5). It was found that reversal of Reactions 1 and 2 is negligible, but that for Reactions 3 and 4 it becomes significant at high conversions. The calculated equilibrium constants are plotted as functions of temperature in Fig. 7 and may be approximated from the values of ΔH°_{1300} and ΔS°_{1300} given in Table 1. Since neither the standard entropy or enthalpy changes vary greatly with temperature the following equation may be assumed to be applicable over the range from 1100 - 1500° F.:

$$K = e^{(-\Delta H^\circ_{1300}/RT) + (\Delta S^\circ_{1300}/R)} \quad \ldots\ldots (6)$$

Production Distribution vs. Space Velocity

If it is assumed that propane is decomposed to a significant extent only by the primary reactions, their absolute rates permit evalution of complete relationships between product distribution and space velocity from the product distribution vs. conversion relationships of Figs. 1-5. These figures are first used for direct calculation of the partial pressures of all components at selected conversions. From these partial pressures the corresponding rates of Reactions 1-4 are calculated from the rate equations of Table 1. Then, considering an elementary reactor section of volume dV operating under steady-state flow conditions with a feed rate F, the following

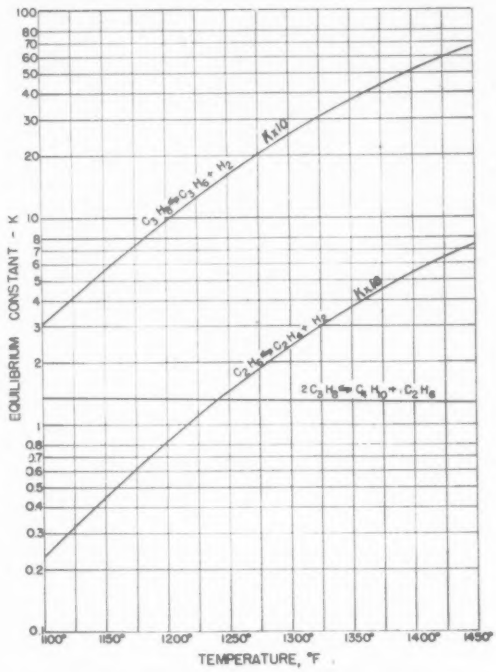


Fig. 7—Equilibrium constants (activities in atmospheres)

TABLE 1—Effective Overall Reactions in Propane Pyrolysis

1. $C_3H_8 \longrightarrow C_2H_4 + CH_4$

$r = k\pi \frac{n_{C_3H_8}}{n_t}$; (moles of propane)

$A = 3.0158 \times 10^{14}$; $\Delta H^* = 66{,}500$

2. $2C_3H_8 \longrightarrow C_2H_6 + C_3H_6 + CH_4$

$r = k\pi \frac{n_{C_3H_8}}{n_t}$; (moles of propane)

$A = 3.6745 \times 10^{13}$ $\Delta H^* = 65{,}000$

3. $C_3H_8 \rightleftharpoons C_3H_6 + H_2$

$r = k\pi \left[\frac{n_{C_3H_8}}{n_t} - \frac{n_{C_3H_6} n_{H_2}\pi}{n_t^2 K}\right]$; (moles of propane)

$A = 9.989 \times 10^{12}$; $\Delta H^* = 60{,}000$

$\Delta H^\circ_{1300} = 30{,}505$ $\Delta S^\circ_{1300} = 32.85$

4. $2C_3H_8 \rightleftharpoons C_2H_6 + C_4H_{10}$

$r = k\pi \left[\frac{n_{C_3H_8}}{n_t} - \sqrt{\frac{n_{C_2H_6} \; n_{C_4H_{10}}}{n_t^2 \; K}}\right]$; (moles of propane)

$A = 2.490 \times 10^{10}$ $\Delta H^* = 54{,}000$

$K = 1.30$ (Substantially independent of temperature)

5. $C_3H_6 + H_2 \longrightarrow CH_4 + C_2H_4$

$r = k\pi \frac{n_{C_3H_6}}{n_t}$; (moles of propylene)

$A = 5.266 \times 10^{7}$ $\Delta H^* = 38{,}000$

6. $C_3H_6 \longrightarrow .149CH_4 + .064C_2H_2 + .2555C_2H_4 + .085C_4H_8 + .2555C_4H_6 + .0745C_6H_{10} + .0745H_2 + .053C_2H_6 + .053C_4H_6$

$r = k\pi \frac{n_{C_3H_6}}{n_t}$; (moles of propylene)

$A = 2.746 \times 10^{12}$ $\Delta H^* = 56{,}000$

7. $C_4H_{10} \longrightarrow .12H_2 + .49CH_4 + .39C_2H_4 + .38C_2H_6 + .49C_3H_6 + .01C_3H_8 + .12C_4H_8$

$r = k\pi \frac{n_{C_4H_{10}}}{n_t}$; (moles of butane)

$A = 4.78 \times 10^{14}$ $\Delta H^* = 63{,}000$

8. $C_2H_6 \rightleftharpoons C_2H_4 + H_2$

$r = k\pi \left[\frac{n_{C_2H_6}}{n_t} - \frac{n_{C_2H_4} \; n_{H_2}\pi}{n_t^2 \quad K}\right]$

$A = 9.83 \times 10^{12}$ $\Delta H^* = 63{,}000$

$\Delta H^\circ_{1300} = 34{,}316$ $\Delta S^\circ_{1300} = 32.12$

9. $C_4H_8 + H_2 \longrightarrow CH_4 + C_3H_6$

$r = k\pi \frac{n_{C_4H_8}}{n_t}$; (moles of butylene)

$A = 4.743 \times 10^{15}$ $\Delta H^* = 67{,}000$

10. $0.287C_2H_2 + 0.333C_6H_{10} + 0.38C_6H_6 \longrightarrow 0.472C_6H_6 + 0.91CH_4 + 0.333C_2H_4 + 0.178C$

$r = k\pi^2 \left(\frac{n_{HHC}}{n_t}\right)^2$; (moles of total reactants)

(HHC = combined moles of reactants)

$A = 9.34 \times 10^{9}$ $\Delta H^* = 35{,}000$

---

where

π = total pressure, (atm.)

$k = Ae^{-\Delta H^*/RT}$

$K = e^{(-\Delta H^\circ/RT) + (\Delta S^\circ/R)}$

ΔH^* = cal./(g-mole)

ΔH° = cal./(g-mole)

r = rate of reaction, (lb-moles)/(cu. ft.) (hr.)

differential material balance may be written if longitudinal diffusion in the reactor is neglected:

$$F dx_A = r_A dV \quad \ldots\ldots (7)$$

where,

F = feed rate, moles/time,

x_A = moles propane converted per mole of feed,

r_A = total rate of reaction of propane = $r_1+r_2+r_3+r_4$, moles/(volume) (time),

V = reactor volume.

Rearranging and integrating,

$$\frac{V}{F} = \frac{M_F}{S_v \rho_F} = \int_0^{x_A} \frac{dx_A}{r_A} \quad \ldots\ldots (8)$$

where

M_F = mean molecular weight of feed,

ρ_F = density of feed at standard conditions, mass/volume,

S_v = space velocity, (volume at standard conditions)/(vol. reactor) (time).

Equation 8 may be integrated for any fixed conditions of temperature, pressure and feed composition, such as are represented by Figs. 1 and 2, by plotting a curve relating values of $1/r_A$, based on the experimental partial pressures, as ordinates to x_A. The area under this curve between zero and any selected value of x_A is equal to the value of V/F required for this conversion. In this manner curves are developed for the conditions of Figs 1-5 which relate space velocity or V/F to the conversion of propane by the combined primary reactions actually occurring in the presence of all secondary and tertiary reactions. In these integrations r_A in Equation 8 is equal to the combined rate of Reactions 1-4 corresponding to the actual partial pressure of propane indicated by the complete product distribution data at conversion x_A. Corresponding curves are then plotted from the complete product distribution data to express as functions of V/F the number of moles of each product present per mole of propane *fed*. A typical curve for component R, which is the product of a primary reaction, is shown by the lower curve in Fig. 8.

From the rates and product distributions of the individual primary reactions the total number of moles of the products of these reactions which were originally formed are calculated from the integration of Equation 8 described above and plotted as functions of V/F. The reversal of the reactions is considered in these integrations. Such a relationship for component R is shown by the upper curve of Fig. 8. The difference between the two curves of Fig. 8 represents the number of moles of product R which are destroyed by secondary reactions. This difference is plotted as a function of V/F in Fig. 9. Similar curves are plotted for all of the products of the primary reactions. In some cases the net rate of destruction of a primary product is negative, indicating that it is produced by secondary reactions at a rate greater than its rate of destruction.

Secondary Reactions

By consideration of the simultaneous appearance and disappearance of components due to secondary and tertiary reactions as indicated by curves of the type of Fig. 9 it was possible to arrive at a series of stoichiometric equations which satisfactorily account for the proportions of all of the principal products. These are Reactions 5-10 of Table 1.

Reaction 5, indicating the combination of hydrogen and propylene to form methane and ethylene, is required by the data of Schneider and Frolich which indicate disappearance of both hydrogen and propylene at high conversions with corresponding formation of methane and ethylene which is difficult to account for in any other way. Such a reaction would not be expected of molecular hydrogen and propylene and may be looked upon as a net result of a free radical mechanism characteristic of the system existing in propane pyrolysis.

Reaction 6 represents the pyrolysis of propylene with a product distribution based upon the results of Schneider and Frolich[17] in experiments on pure propylene with low conversions. The C_5H_8 and C_6H_{10} are diolefins whose presence was suggested but not proved by these investigators. Reaction 7 represents the pyrolysis of butane with a product distribution based upon the data reported by Frey and Hepp[6]. Reaction 8 represents the generally accepted course of the pyrolysis of ethane to form ethylene and hydrogen. Reaction 9 is similar in type to Reaction 5 and was required to account for the disappearance of hydrogen and the corresponding formation of methane at high conversions.

Reaction 10 is a somewhat uncertain tertiary balancing reaction which was introduced to account for the aromatics and carbon found at high conversions. The extent of this reaction is small and it merely presents a semi-quantitative overall mechanism for the conversion of diolefins to aromatics with attendant formation of carbon and methane as required by the trends of the product distribution data. The reactants are formed in the fixed proportions indicated as a result of Reaction 6.

It must be emphasized that these are merely empirical net overall reactions which are merely selected to represent the results observed in propane pyrolysis. The assumption that the same reactions occur in other systems might lead to serious errors. It is also evident that this analysis neglects many tertiary reactions and products and attempts to consider only those most important in the common applications of the process.

Net Rates of Secondary Reactions

An equation similar to Equation 7 may be written to represent the conversion of a product R in an incremental reactor volume dV. Then,

$$r_R = dx_R/d(V/F) \quad \ldots\ldots 9$$

It is evident from Equation 9 that the absolute rate at which component R is destroyed at any point in the reactor is represented by the corresponding slope of the curve in Fig. 9. Since the partial pressures of all components at any point are known from the curves relating product distribution to V/F, such a value of the absolute rate of reaction permits direct calculation of the apparent velocity constant corresponding to any selected form of rate equation. The form may be verified by comparing constants determined at various values of V/F.

Although the determination of absolute reaction rates by graphical differentiation of curves such as those shown in Fig. 9 is theoretically sound the results are frequently unsatisfactory

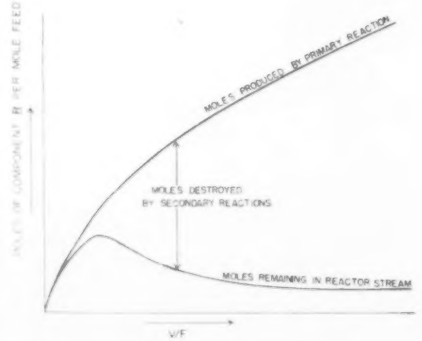


Fig. 8 (left)—Production and destruction of a primary product

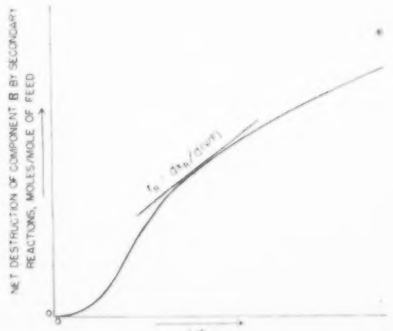
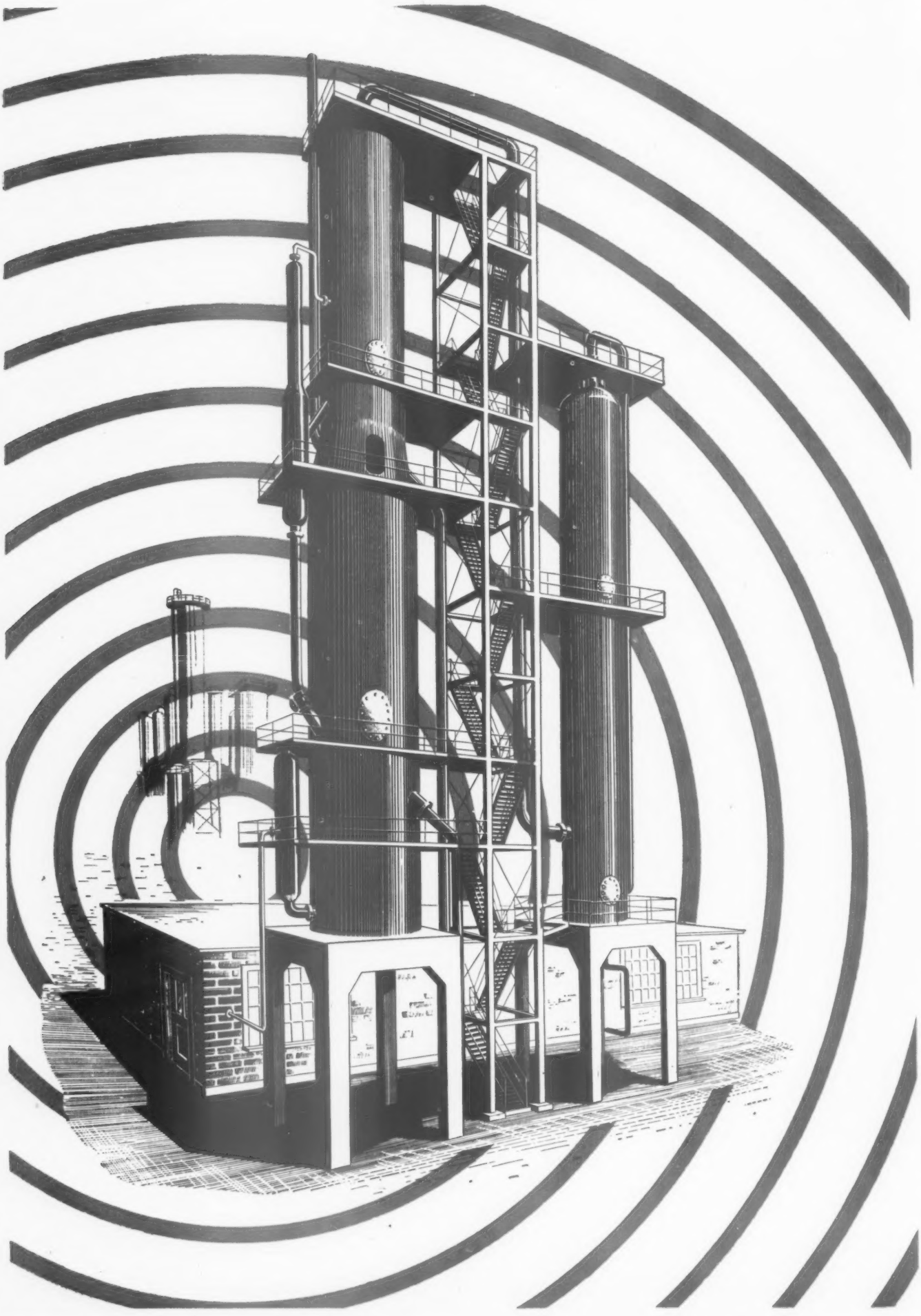


Fig. 9 (right)—Rate of a secondary reaction



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because of uncertainty as to the proper shape of the experimental curve. Small changes in the shape of the curve have relatively large effects on the measured slopes and result in widely varying velocity constants, which are difficult to average properly.

A more direct and accurate method of evaluating velocity constants which was used by Reiser and Watson[14] involves graphical integration based upon Equation 8. If the reaction $A \rightleftharpoons R + S$ is first order in the forward direction its rate is expressed by the following equation:

$$r_A = k\pi\left(\frac{n_A}{n_t} - \frac{n_R n_S \pi}{n_t^2 K}\right) \quad \ldots\ldots (10)$$

Combining Equations 10 and 9 and rearranging,

$$k = \frac{F}{V\pi}\int_0^{x_A} \frac{dx_A}{\left(\frac{n_A}{n_t} - \frac{n_R n_S \pi}{n_t^2 K}\right)} \quad \ldots\ldots (11)$$

where

V/F corresponds to the conversion x_A,

n_A, n_R = moles of A, R per unit of feed,
n_t = total moles per unit of feed,
K = equilibrium constant,
π = total pressure.

The integral of Equation 11 is evaluated by measuring the area under a curve relating x_A as abscissas to the quantity $1/(n_A/n_t - n_R n_S \pi/n_t^2 K)$. The average reaction velocity constant up to any conversion x_A is this area multiplied by the value of $F/V\pi$ corresponding to conversion x_A. In this manner a series of values of k may be established from different points along the curve of Fig. 9. The constancy of these values indicates the accuracy of the equation.

This procedure was applied to determine the rate of each reaction whose rate could be established by the net appearance or disappearance of a single component. The rate of Reaction 8 was taken from the literature[6] with the enthalpy of activation recommended by Burk and coworkers[2] and the equilibrium constant calculated from the thermodynamic data[5, 13, 15]. The establishment of the rate of one reaction permits others to be evaluated in a progressive procedure. It was necessary to resort to a trial and error procedure in order to proportion the destruction of propylene between Reactions 5 and 6 to give the best agreement with the data.

All of the reactions were assumed to be of first order except Reaction 10, which was taken as second order. The reaction velocity constants were evaluated at the low pressure and the two temperatures of Figs. 1-4. The assumed orders of reaction were then tested by applying the rate equations to calculation of the results at the high pressure conditions of Fig. 5.

The apparent enthalpies of activation are theoretically determined by the results at the two temperatures of Figs. 1-4. However, because of the uncertainty of the data for components present in small quantities, the value of $\Delta H°$ for Reaction 7 was taken as the value recommended by Burk and coworkers rather than the slightly different value indicated by the data.

Integration of Rate Equations

In order to test the validity of the rate equations of Table 1, integrations were carried out to calculate the product distributions shown in Figs. 1-5. Such integrations must be carried out by a progressive, stepwise procedure starting from the inlet of the reactor. Small finite increments are considered, in each of which the average rate of each reaction may be taken as corresponding to the arithmetic averages of the partial pressures entering and leaving the increment. Thus, for Reaction 1,

$$\Delta x_1 = (r_1)_{ave} \cdot \Delta(V/F) \quad \ldots\ldots (12)$$

where $(r_1)_{ave}$ corresponds to the arithmetic mean conditions. By considering the conversions produced by all reactions in each successive increment, complete product distribution and conversion relationships are developed. This procedure is demonstrated for a more complex case in the following section.

(EDITOR'S NOTE: The balance of this article, presenting an illustrative design problem employing the methods developed in the preceding section, will be published in the next issue.)

Acknowledgment

The work here reported was made possible by the financial support of the Wisconsin Alumni Research Foundation.

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TECHNICAL MEETINGS FOR OIL MEN

May

7-8, American Gas Association, Natural Gas Department, annual spring meeting, Hotel Gibson, Cincinnati, Ohio.
7-9, National Association of Corrosion Engineers, annual meeting, President Hotel, Kansas City, Mo.
15-17, American Oil Chemists Society, annual meeting, Roosevelt Hotel, New Orleans.

June

2-7, Society of Automotive Engineers, semi-annual meeting, French Lick Springs Hotel, French Lick, Ind.
20-23, Society for the Promotion of Engineering Education, 53rd Annual meeting, Jefferson Hotel, St. Louis.
24-28, American Society for Testing Materials, annual meeting, Statler Hotel, Buffalo.

September

9-13, American Chemical Society, 110th meeting, Chicago.
10-14, 4th National Chemical Exposition, Coliseum, Chicago.
16-20, National Instrument Conference, sponsored by Instrument Society of America, William Penn Hotel, Pittsburgh.
29-Oct. 2, National Lubricating Grease Institute, 14th annual meeting, Edgewater Beach Hotel, Chicago.

October

7-12, American Gas Association, annual meeting, Atlantic City.

November

7-8, Society of Automotive Engineers, National Fuels and Lubricants meeting, Mayo Hotel, Tulsa.
11-14, American Petroleum Institute, annual meeting, Stevens Hotel, Chicago.

PERSONALS

Petroleum Technologists in the Headlines

F. C. Cutting has been named assistant manager of the Research and Development Dept. in Shell Oil Co.'s head offices in New York City. Mr. Cutting has been with Shell since 1925. For the past decade he has been asst. superintendent and superintendent at the East Chicago and Wood River refineries, respectively.

Mr. Cutting

Other recent Shell appointments include **G. C. Cunningham** as superintendent of operations at the Wood River refinery, **L. A. Lohman** as superintendent of administration at Wood River, and **P. E. Keegan** as superintendent of administration of the Houston refinery.

Mr. Cunningham, with Shell since 1924, was previously assistant to the general manager of the Manufacturing Dept. in New York. Mr. Lohman was asst. manager of the Industrial Relations Dept. and Mr. Keegan asst. manager of the Personnel Dept., both in New York.

° ° °

Bonner H. Barnes is assistant general manager, Manufacturing Dept., Gulf Oil Corp., with headquarters in Pittsburgh. He started with Gulf in June of 1921 as a chemist at the Port Arthur refinery. After holding various positions in the company's Texas plants he was transferred to the Toledo refinery as superintendent in 1931. In 1935 he went back to the Port Arthur refinery as assistant general superintendent and in 1939 was promoted to general superintendent of Gulf's Texas refineries. In 1945 he resigned to go with PAW in Washington as Assistant Director of Refining, in Charge of Refining Operations and Technical Processes. He was released from PAW last Nov. 1.

Mr. Barnes

° ° °

Maclean Houston, United Refining Co., Warren, Pa., was reelected chairman of the Technical Advisory Committee of the Pennsylvania Grade Crude Oil Assn. **G. M. Kirkwood,** Karns City, Pa., is vice chairman.

Stewart S. Kurtz, Jr., Sun Oil Co., Norwood, Pa., and **Louis Schmerling,** Research and Development Laboratories, Universal Oil Products Co., Riverside, Ill., are members of a new Committee on Nomenclature of the Division of Organic Chemistry of the American Chemical Society. The committee, of which H. S. Nutting, Dow Chemical Co., Midland, Mich., is temporary chairman, is to study the improvement of the nomenclature of organic compounds.

° ° °

L. G. Mason is manager of the new Philblack Sales Laboratory in Akron acquired by Phillips Petroleum Co. from Hycar Chemical Co. A graduate in chemical engineering from Iowa State College, Mr. Mason was with B. F. Goodrich Co. for 14 years, leaving in 1942 to become assistant chief chemist of Jenkins Brothers, Bridgeport, Conn. In 1943 he joined the Seiberling Rubber Co.

° ° °

Hugh A. Neal, recently released after 5 years in the Army, has rejoined Phillips Petroleum Co., Bartlesville, Okla., as assistant manager of the Perco division, chemical products department.

° ° °

Donald Lincoln has been appointed manager of the refinery supply and distribution division of Sun Oil Co. He was formerly manager of the refinery production control division. He joined Sun Oil Co. in 1930.

Clifford Johnson was made assistant superintendent of the company's Marcus Hook refinery in charge of maintenance and construction. He succeeds **Alan T. Knight,** who was elected vice president of the newly organized Catalytic Engineering and Construction Co.

John E. Lilley, formerly project engineer, has been appointed chief construction engineer of the Marcus Hook refinery and **Vaughn S. Whitesell** formerly maintenance engineer, has been appointed chief maintenance engineer.

Howard B. Sheppard has been promoted to project engineer in the Manufacturing Department.

Mr. Lincoln

Mr. Johnson

Harold G. Osborn, for the past 11 years Manager of Manufacturing for Continental Oil Co., has assumed full charge of Continental's eight refineries, following the retirement of Dr. Walter Miller, vice president.

Mr. Osborn

Mr. Osborn has been part of the executive staff of the company's manufacturing department since 1921, when he was employed in the power division of the Ponca City refinery.

The following year he was made office assistant to Dr. Miller. Upon the completion of the enlargement of the Ponca City refinery in 1926, he served for a year as assistant superintendent of the plant, returning to the general manufacturing staff in 1927 as assistant manager. Mr. Osborn was made Manager of Manufacturing in 1935.

° ° °

Lloyd F. Bayer, vice president and a director of Tide Water Associated Oil Co., has received the Honor Award Medallion for notable achievement of Stevens Institute of Technology. The presentation was made at the annual alumni dinner in New York.

Mr. Bayer

Mr. Bayer received a degree in mechanical engineering from Stevens in 1914 and has been with Tide Water since 1916. He is now chairman of the operating committee of the western division of the company. During the war among other activities he served as a member of the refining committee of District No. 5 (West Coast) of PAW.

° ° °

Henry E. Widdell has succeeded to the presidency of the Arthur G. McKee Co., widely known engineering firm with headquarters in Cleveland. Mr. Widdell, principal owner of the Widdell Engineering Co., became associated with the McKee company in 1925, when the latter concern was seeking to enter the petroleum refining field.

Several years later the Widdell company was absorbed by the McKee com-

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Lubricating Oil Additives (*By G. G. Pritzker*)

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A. S. T. M. Standard on Petroleum Products and Lubricants

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pany and since then Mr. Widdell has been a director and executive vice president. **Arthur G. McKee**, formerly president, will continue to participate in company affairs as chairman of the advisory committee.

° ° °

Dr. William Noble Lacey, professor at California Institute of Technology, was the ninth recipient of the Hanlon Award, presented each year by the Natural Gasoline Assn. of America. The citation was for his investigations which have resulted in increased recovery of both liquids and gases from underground petroleum reservoirs. Dr. Lacey was represented in absentia by M. L. Arnold, Richfield Oil Co., president of the California Natural Gasoline Assn.

Dr. Lacey

° ° °

M. W. Kellogg has been elected chairman of the board of the M. W. Kellogg Co., petroleum and chemical engineers and fabricators of heavy industrial equipment; **H. R. Austin**, president; **F. E. Johnson**, vice chairman of the board, and **L. H. Harvison**, executive vice president.

The creation of the two new executive positions of chairman and vice chairman of the board was necessitated by the company's proposed expanded program of industrial engineering, including petroleum engineering; manufacturing and process development.

Mr. Harvison

Mr. Austin

° ° °

W. H. Fortney, Baytown, Texas, head of Humble Oil & Refining Co.'s Baytown refinery instrument department, is the first president of a new technical group, Houston Instrument Society. Formed to study problems in all types of industrial instrumentation, the society now has at least 80 members, starting with 25 when organized Dec. 5, 1945.

Mr. Fortney is a man of several jobs. Besides his "regular" work with Humble and the demands of the new instrument society, he finds time to be president of Harris County Water Control and Improvement District No. 7. This district recently bought out the Humble refinery

employe-owned Baytown Utilities Corp. which supplied city conveniences, built a new $46,000 sewage disposal plant, laid $45,000 worth of new sewer and water lines, $19,000 of fire and water lines, and still has $95,000 left from a bond issue for further civic improvements.

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George L. Parkhurst has been elected president of the Oronite Chemical Co., subsidiary of Standard of California. He was formerly vice president in charge of products and processes. He succeeds **R. G. Smith,** who will continue with Oronite as a member of the board of directors.

Mr. Parkhurst

During the war Mr. Parkhurst was with P. A. W., where, as assistant director of refining and later contract executive, he was responsible for plant approvals, contracts and prices in connection with the 100-octane aviation gasoline program. Prior to the war he was with Standard Oil Co. (Indiana). He is a graduate in chemical engineering of Illinois Institute of Technology and also received a degree in law from De Paul University.

o o o

Edward W. Isom, vice president of Sinclair Refining Co. and president of Sinclair Rubber, Inc., recently received the Stevens Honor award of Stevens Institute of Technology for notable achievement in the oil industry engineering field.

Mr. Isom

Mr. Isom has been director of Research and Development for Sinclair Refining Co. for more than 20 years. In 1916 he constructed a pilot cracking plant embodying the process which later came to bear his name, and a continuous operating comercial plant was built in 1920. During 1940 Mr. Isom pioneered in the development of centrifugal contactors for the alkylation reaction.

o o o

Donald P. Krotz is assistant to the president of the California Research Corp., subsidiary of the Standard of California. After graduating from Stanford University in chemical engineering he joined the Standard of California in 1926, starting in at the Richmond refinery.

o o o

Richard P. Price, assistant superintendent, Atlas refinery of Socony-Vacuum Oil Co., Inc., has been promoted to superintendent. He succeeds **R. T. Lockwood,** who has retired. **Herbert Shepard** has been promoted to assistant superintendent.

o o o

John H. McCarthy, Jr., formerly with Hercules Powder Co., has joined the patent department of Shell Development Co., San Francisco, as a patent agent.

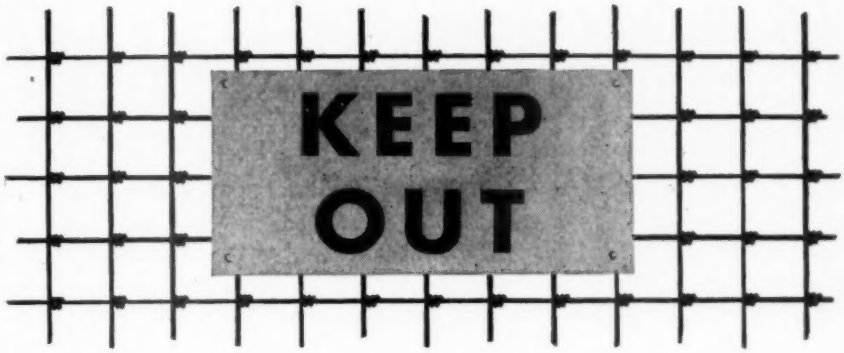
o o o

F. B. Haverfield has been named manager of the natural gasoline and gas division of Continental Oil Co., succeeding **R. A. Carter,** who resigned.

Mr. Haverfield joined Continental in 1929 as plant chemist at Big Lake, Texas. In 1939 he was made assistant superintendent of the natural gasoline department, with headquarters at Ponca City, and was made assistant manager four years later.

Mr. Haverfield

D. B. Edwards, who has been assistant to the manager of the department, succeeds Mr. Haverfield as assistant manager, **F. B. Wilson** succeeds Mr. Edwards as assistant to the manager.



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WIDENING HORIZONS

Views on Personnel, Management and Economic as Well as Technological Developments in Petroleum Refining and Natural Gas Processing: Comment from Readers is Invited

Bring Output of Natural Gasoline and Cycling Plants Into The Total Supply and Demand Picture

SIGNIFICANT of a growing trend of thought in the oil industry is the discussion of the economic disposition of the products of the natural gasoline and cycling plants which extract liquid materials from natural gas. This subject was presented in papers before the recent meetings of the Western Petroleum Refiners Assn. in Fort Worth and of the Natural Gasoline Assn. of America in Dallas.

The topic, of course, has been a perennial one for the natural gasoline manufacturers since their association was organized 25 years ago. In the meantime the cycling industry has become well established. Some markets have been enlarged and some new ones created for the light liquid hydrocarbons. These and other new conditions today add to the importance of the consideration of the question; to what extent should the liquid products of the natural gasoline and related industries be considered as materials for further processing, rather than being marketed directly as finished products.

To show the importance to the oil industry of the present volume of materials supplied by the natural gasoline and related industries, President J. H. Dunn of the N.G.A.A. told his association their total production in 1945 was 111,000,000 bbls. (See pg. R-380). This is over 6% of the 1945 crude oil production of the country and an important volume, in part at least, of processing materials for the industry to consider. This is almost three times the volume output of only 10 years ago.

This growth in volume is likely to increase as the strict conservation of natural gas is applied in the oil and gas producing states. Commissioner Ernest O. Thompson, of the Railroad Commission of Texas, told the W. P. R. A. at Fort Worth: "Plan to utilize these lighter hydrocarbons that are surely going to be made more and more abundant by rigid conservation practices.

"Public opinion and good morale and science will demand that the products of conservation, which these raw materials are and which the greatly enlarged quantity will be, should be used first in making motor fuels and that the crude oil in the reservoir shall be brought forth only in sufficient quantities to make up the difference."

Again, if and as crude oil production in the U. S. drops off and the demand for its products continues to rise, liquid hydrocarbons from the natural gasoline and related industries will be of even greater economic importance. With higher crude prices the refiner will ask himself at some point whether it will be more economical for him to buy the additional crude to meet his demand, or to use the products of the natural gasoline and related industries as far as he can to meet his needs for additional materials for processing.

The growing transportation of natural gasoline products by pipeline, rather than by tank car, reflects the trend for the refiner to consider the light hydrocarbons as raw materials. President Dunn told the natural gasoline manufacturers that 50% of natural gasoline now moves to market by pipeline. However, he stated, the natural gasoline plant operator still receives a price based upon non-competitive transportation by rail.

"This trend toward greater pipeline movement of natural gasoline products may make it possible for the refiner to consider these products on a competitive commodity basis", he stated. "If the refiner can do this, the natural gasoline plant operator must stand ready to furnish products to the specifications desired."

As pointed out by President Dunn, the analysis of the possible utilization of natural gasoline and other light hydrocarbons made by Commissioner Thompson in his paper suggests: "The proper yardstick of conservation may be a total hydrocarbon balance of supply and demand." In other words, the current balance sheet of the industry showing its supply of raw materials and demand for its finished products should include the liquid products coming from natural gas, as well as the crude oil itself.

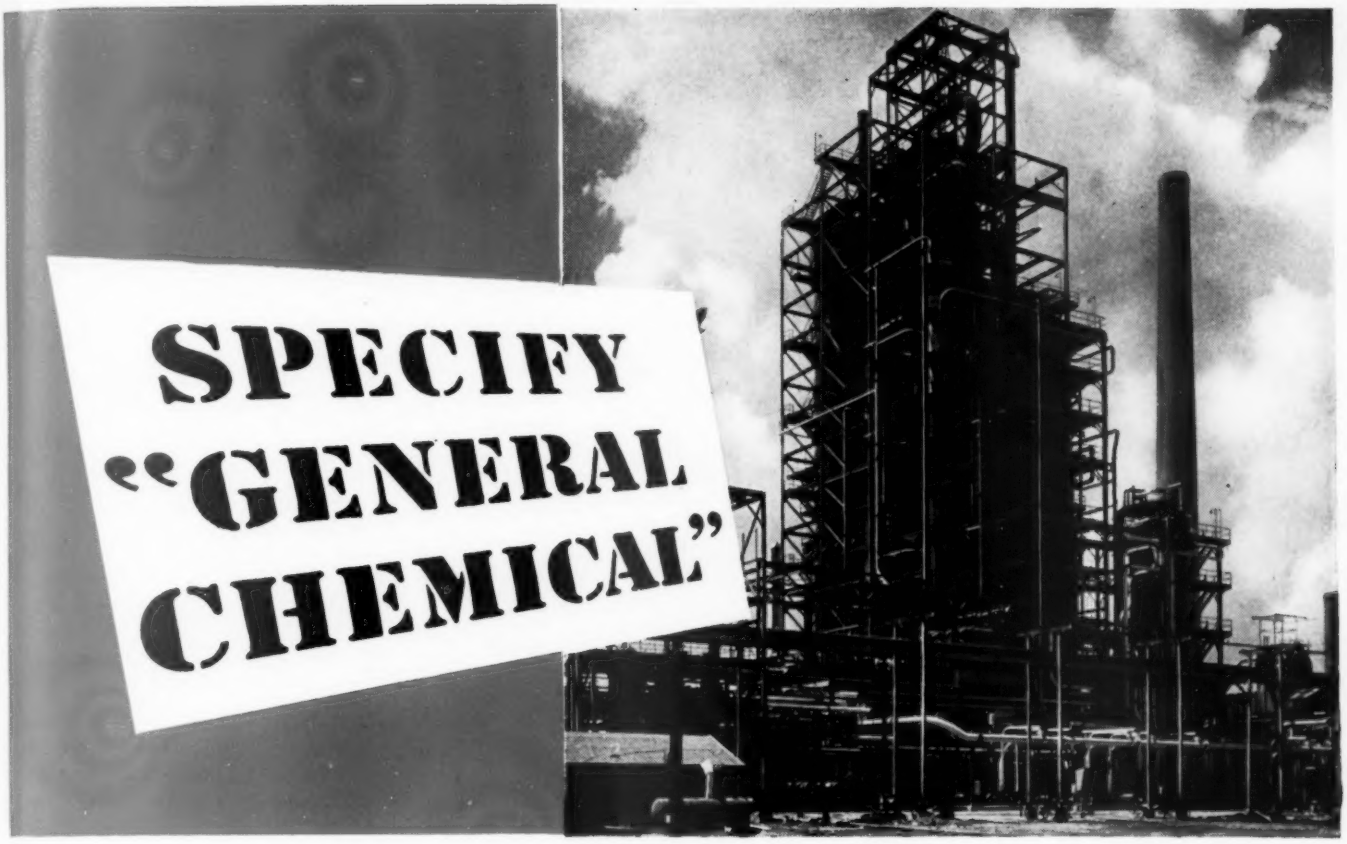
The liquefied petroleum hydrocarbons would have to be broken up in such manner as to indicate their relative volumes of propane, butanes, butane-free gasoline equivalent, and heavier than gasoline material, regardless as to whether they came from natural gasoline or cycling plants. The portions of these hydrocarbons available for use as raw materials would be reported as supply, along with crude production.

The principal sources of supply of the light hydrocarbons also would have to be taken into account and the state regulatory bodies would have to take these liquid products from gas into consideration when making demand estimates and setting crude production allowable, if the indusrty's balance sheet were to be all-inclusive.

Setting up its monthly reports on the natural gasoline and gas cycling industry in such manner as to show the volume of finished products, and of materials available for further processing, would call for a considerable change in the method and style of report used by the U. S. Bureau of Mines at present, it is recognized.

However, some such program as outlined above might be something for the Bureau staff and the oil industry advisory committee recently set up to assist it to consider, especially since the Bureau's present method of reporting operations for the natural gasoline and related industries is considered by many to be outmoded and slow in being released as well. A method of reporting which showed the volume of light liquid hydrocarbons available for further processing would serve to emphasize on the entire industry the need for the most economic and efficient utilization of these liquid products extracted from natural gas, whether as raw materials or finished products.

Such utilization must be forthcoming, said Commissioner Thompson, or "full proration of all base materials shall be the order of the day."



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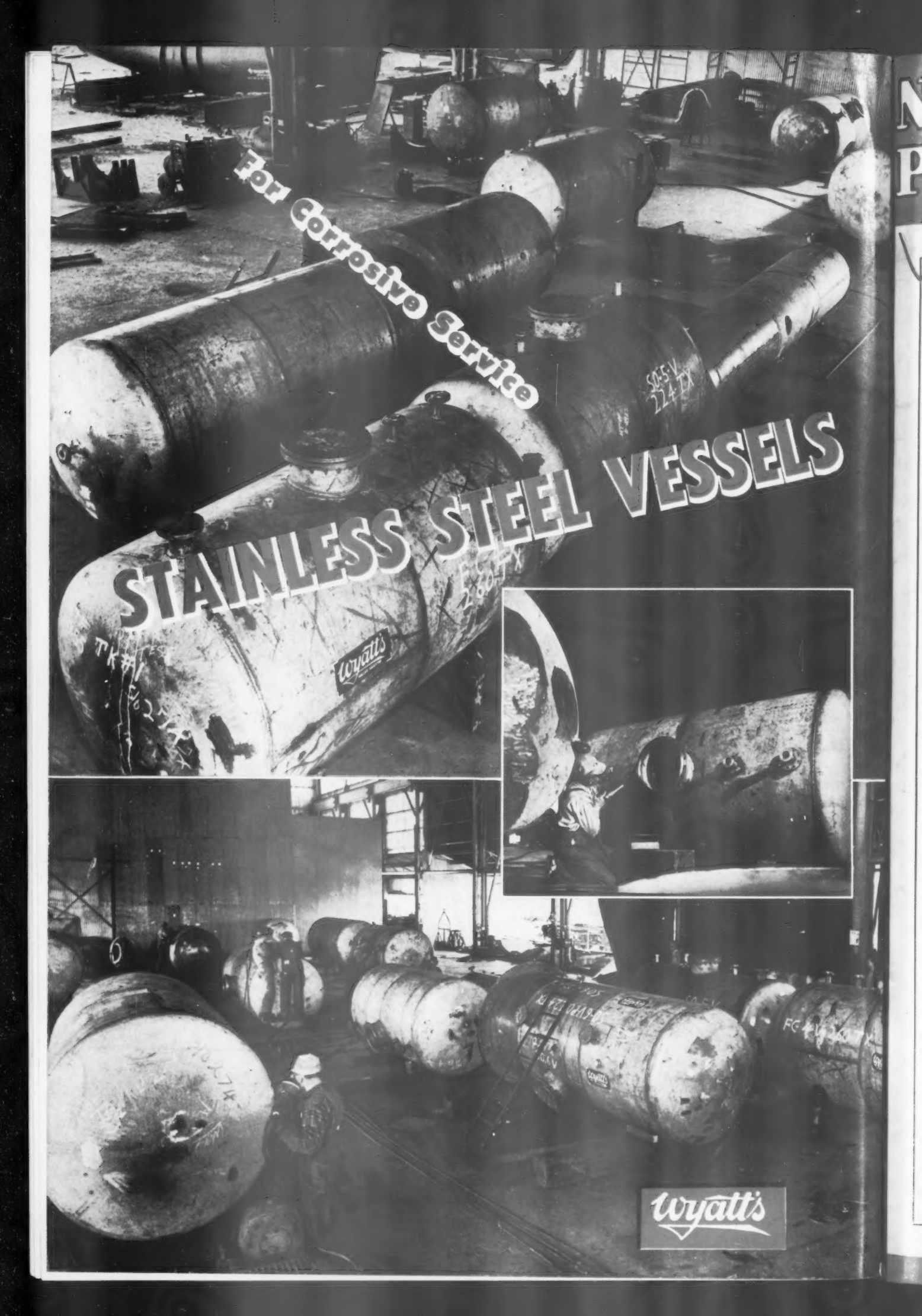
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